GROVE

SCIENTIFIC

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PART I

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EXECUTIVE SUMMARY

The Lake Sue Improvement Association initiated an extensive lake management project on Lakes Sue and Rowena starting January, 1988, in response to degrading water quality. Since then, the participants listed below have undertaken the project and collectively spent $46,805.00 to date on water quality studies, management, macrophyte control and preparation of this proposal. The results of this work are included within.

The project participants are:

- **Lake Sue Improvement Association, represented by Grove Scientific Company**
- **Orange County Environmental Protection Department**
- **City of Orlando**
- **City of Winter Park**
- **Department of Natural Resources, Bureau of Aquatic Plant Management**

This proposal contains information regarding a total lake management plan and demonstration project for Lake Sue with emphasis on revegetating the shoreline with native aquatic plants. According to Mr. Dean Barber, a biologist with the local D.N.R., this project represents the first voluntary combined effort between lakefront residents and multi-governmental agencies to implement a total lake management plan and restore a shoreline to meet the compliance standards of D.N.R.'s "Aquatic Plant Control Rule 16C-20". This would be a valuable demonstration project of multi-interest groups working together to implement an ecologically beneficial program which could have significant impact on future projects of this type.

detailed cost analysis is presented in Section 4.5. The project team will use this proposal to solicit funding to continue this project. The sources targeted for funding support are:

- Florida Department of Natural Resources
- Florida Department of Environmental Regulation
- City of Orlando
- City of Winter Park
- Orange County Environmental Protection Department

SECTION 1

INTRODUCTION

Since the development of Orlando, the lakes in the Howell Branch Drainage Basin have been used for stormwater disposal. The Upper Howell Branch Drainage Basin includes Lakes Dot, Concord, Spring, Adair, Ivanhoe, Highland, Winyah, Estelle, Formosa, Rowena and Sue. All of these lakes are hydraulically connected and the flow of water is towards Lake Sue. As a result, nutrients and other contaminants have been building up in these lakes. Over the past 10-20 years, these lakes have been experiencing a rapid decline in water quality as evidenced by a decrease in water clarity and an increase in suspended algae and macrophytes. A report prepared in 1983 for the East Central Florida Regional Planning Council titled "Analysis of In-Lake Measures in Demonstration Sub Basins", specifically addresses the deterioration of water quality in the upper Howell Branch lakes.

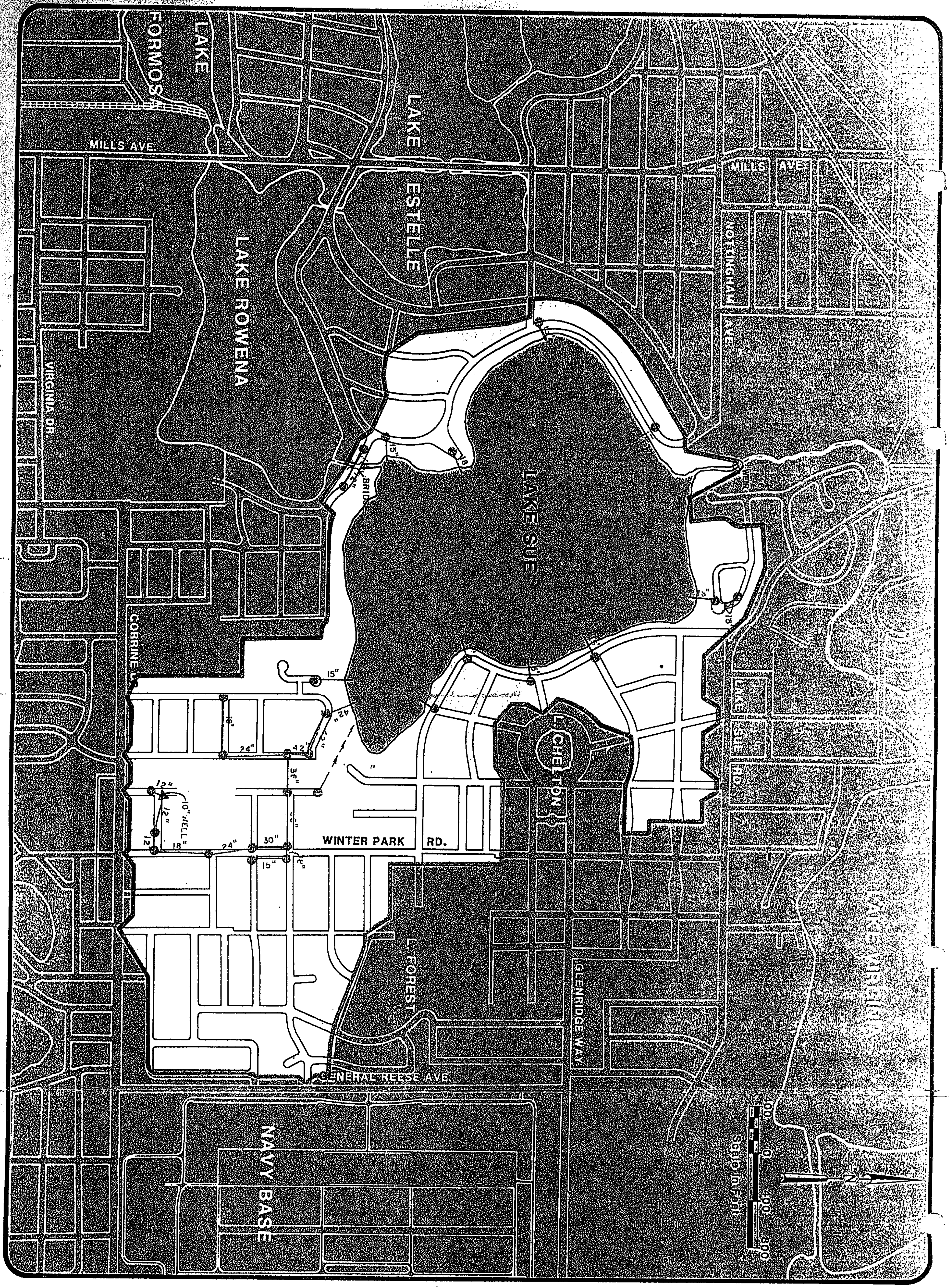
Lake Sue has a total area of 146 acres and a drainage basin of 437 acres. Lake Rowena, which drains into Lake Sue, has a total area of 57 acres but a drainage basin of 844 acres. The Lake Rowena drainage basin includes a significant amount of urbanized area, including the Colonial Mall. A priority for the entire basin, is to eliminate the stormwater disposal practice currently in use.

The City of Orlando has recognized this as a serious problem and has proposed a stormwater utility tax to fund desperately needed changes.

As a first step in rerouting stormwater runoff, the City of Orlando is planning to divert a portion of the runoff from Colonial Mall to the Lake Greenwood Wetlands Project. This rerouting project is referenced as Project #89-413, "Lake Rowena Inflow Cleanup", on the City of Orlando Priority Project List. The city also is experimenting with stormwater treatment by alum addition to further treat runoff. The attached maps clearly identify the drainage basin, for both Lakes Sue and Rowena. (See Figures 1-1, 1-2, and 1-3).

A meeting was held on March 2, 1989 at the State of Florida Department of Natural Resources, Orlando, Florida office to discuss the fate of Lake Sue. The following groups were represented, all of which have a substantial interest in Lake Sue:

* Florida Department of Natural Resources - Has permitting and regulatory control with respect to aquatic plants.
* Lake Sue Improvement Association - Represents the home owners who live on the lake and is the driving force behind its management and protection.

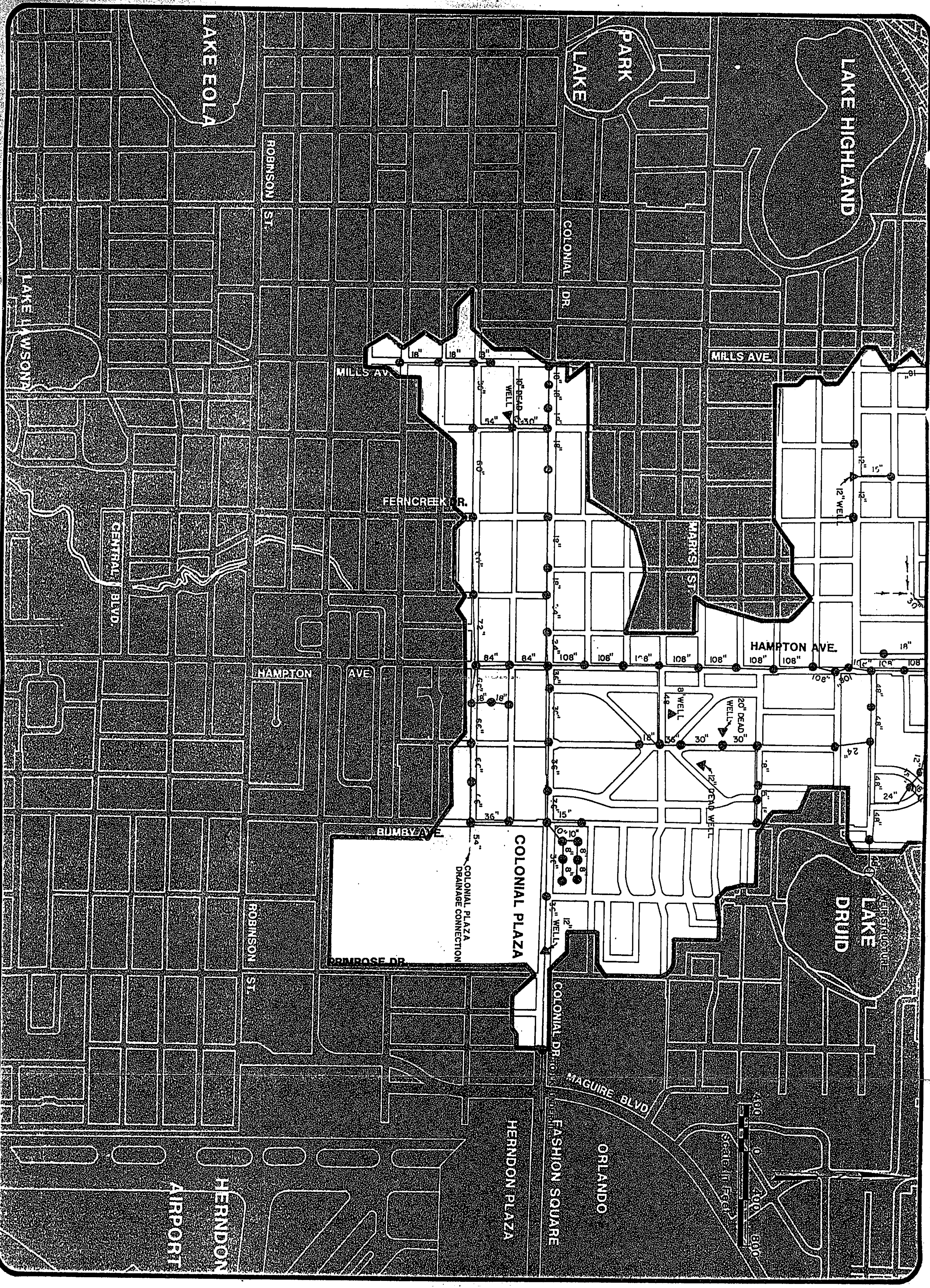


OUSWMM	LAKE SUE SJ-HB-20	LAKE AREA 146 AC. BASIN AREA 437 AC.

EXHIBIT 104

FIGURE 1-1
Lake Sue Drainage Basin

SOURCE: Dyer, Riddle, Mills & Precourt, Inc.



1-4

SHEET 2 OF 2

OUSWMM

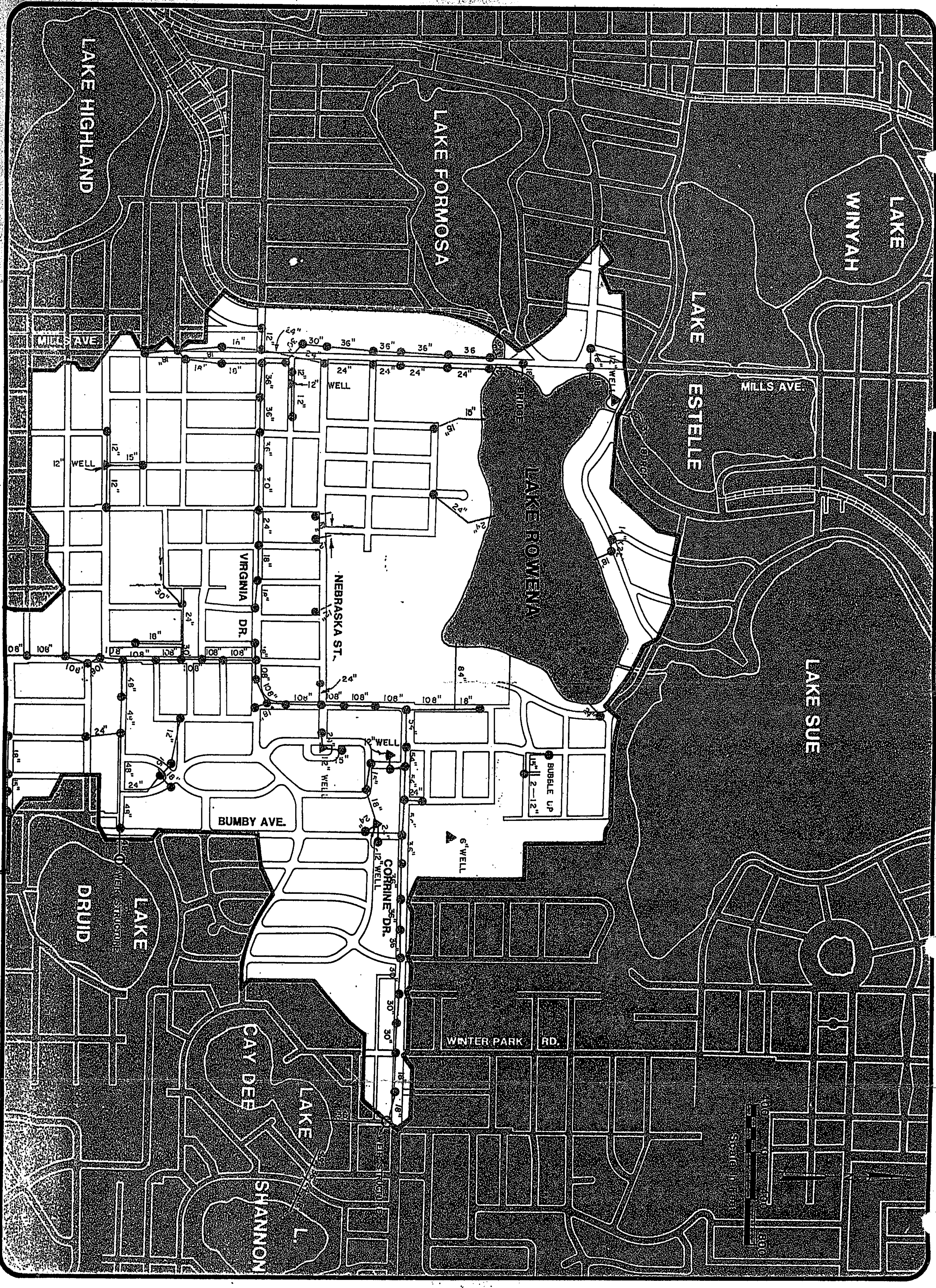
LAKE ROWENA
SJ-HB-21

LAKE AREA	57 AC.
BASIN AREA	844 AC.

EXHIBIT 109

FIGURE 1-2
Lake Rowena Drainage Basin

SOURCE: [illegible], Riddle, Mills & Precourt, Inc.



SHEET 1 OF 2

OUSWMM

LAKE ROWENA
SJ-HB-21

LAKE AREA	57 AC.
BASIN AREA	844 AC.

EXHIBIT 108

FIGURE 1-3
Lake Rowena Drainage Basin

SOURCE: Dyer, Riddle Mills & Precourt, Inc.

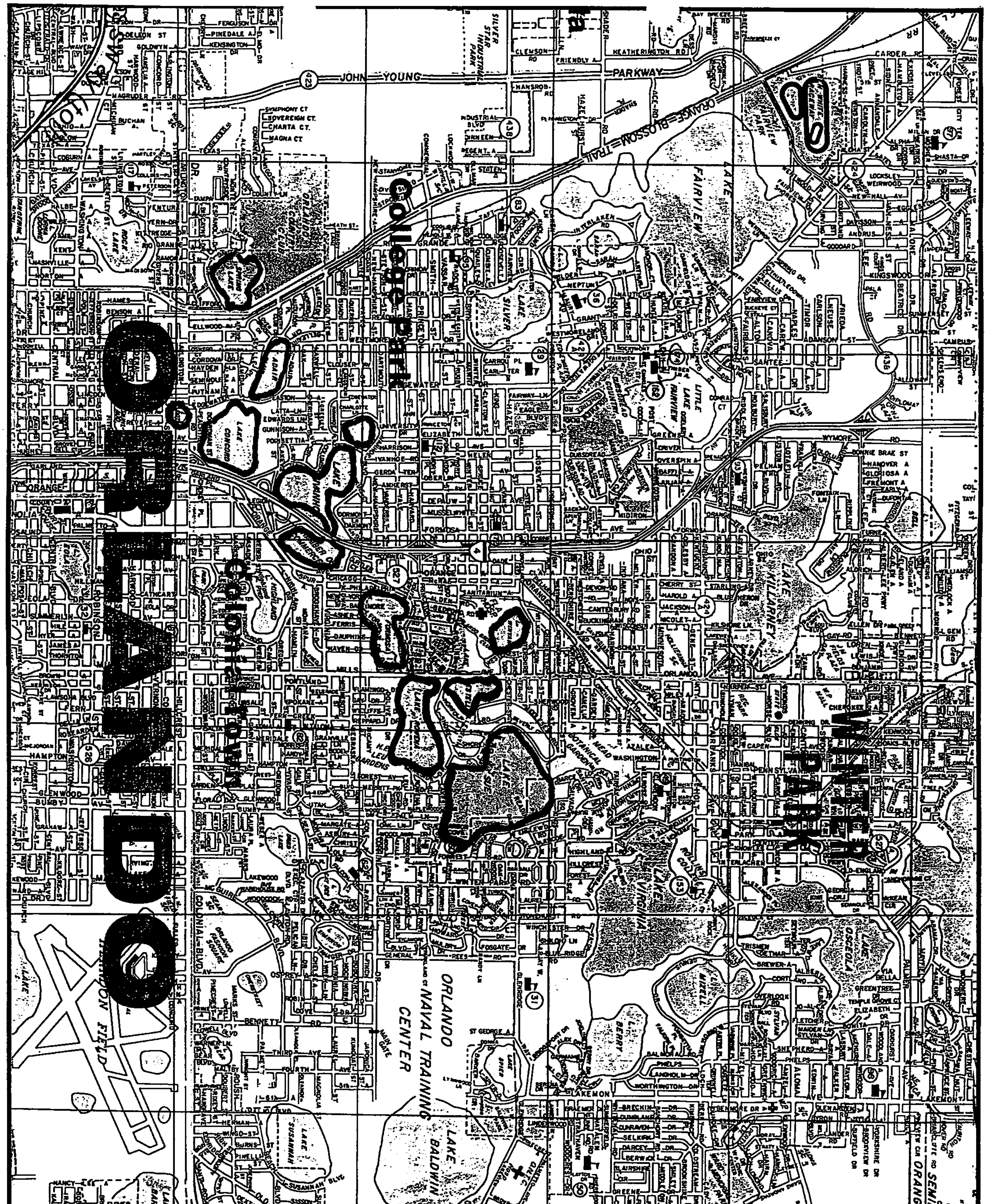


Figure 1-4: Project Vicinity Map - Upper Howell Branch Basin

* City of Orlando - Uses these lakes for stormwater disposal of city controlled property.

* City of Winter Park - Have partial responsibility for compliance, protection, and control of aquatic and shoreline vegetation since a portion of Lake Sue is within their city limits.

* Orange County Environmental Protection Department - Has local regulatory controls, is responsible for administration of the special tax district, conducts monitoring of the lakes and is responsible for controlling aquatic plants.

SECTION 2

OBJECTIVES

2.1 Statement of Objectives

The ultimate goal of each group is to improve the overall quality of Lake Sue through the use of various lake management techniques. However, it has been repeatedly stated that this is a long and difficult process. We have outlined our objectives as stated in the March 2, 1989 meeting and they are as follows:

1. Bring the lake into compliance with DNR Aquatic Plant Control rules listed in chapter 16c-20 of the Florida Administrative Code.
2. Improve recreational use.
3. Improve nutrient abatement.
4. Educate the homeowners.

Each objective will add to the ultimate goal of improving the quality of Lake Sue. Each objective is addressed separately in the following sections and to allow for continuity, each objective is presented as a complete task.

2.2 Objective 1 - Compliance with 16c-20 F.A.C.

In accordance with Chapter 16c-20.0011 "Aquatic Plant Control Permits", of the Florida Administrative Code, 'The Department of Natural Resources shall administer the aquatic plant control program of the state, pursuant to Section 369.20 and 369.22 F.S., through a program of contracts and permits to protect the waters of the state from the uncontrolled growth of aquatic plants which interfere with the use and enjoyment of those waters.'

With respect to Lake Sue, this translates into revegetation of the shoreline with native aquatic plants and maintenance of submerged plants. Positive results we may recognize from revegetation include erosion protection, improved macroinvertebrate populations which may then result in improved fisheries, and an overall aesthetic improvement of the Lake Sue shoreline. Maintenance of submerged aquatic plants is discussed in Section 2.3.

2.2.1 Procedure for Shoreline Revegetation

This objective will be directed by DNR with support from the other group members. As part of this proposal package, the DNR will prepare a permit application and issue a permit before proceeding with revegetation. Funding for this project is addressed in a later section.

The DNR has completed their vegetation survey of Lake Sue and has prepared a vegetation map. A vegetation plan will also be prepared by DNR and will be included in the permit application. From this vegetation plan, a bid specification will be prepared and finalized by the Lake Sue Advisory Board Council. Sealed competitive bids will be solicited from outside contractors and reviewed by the contracting party. It is assumed the Orange County Environmental Protection Department will be the purchasing agent.

Upon selection of a revegetation contractor, the shoreline will be maintained in selected areas as per the revegetation plan. Orange County and the City of Winter Park will be responsible for this program as directed by the DNR. The City of Orlando, Bureau of Streets and Drainage, will provide technical assistance during the revegetation project. The contractor will proceed according to their contract and complete the shoreline clearing and revegetation. Maintenance of the project will also be included in the contract for the first year. The DNR and Grove Scientific Company will evaluate the project on a quarterly basis.

2.3 Objective 2 - Improve Recreational Use

The Lake Sue Improvement Association is very concerned with the overall quality of the lake, but also wants to use the lake for recreation. An unusable lake will adversely affect property value. The parameters necessary for improved recreational use are as follows:

* Good water quality so there is no health hazard to swimmers.
* Good water clarity to make the lake desirable for swimming.
* Good fisheries for sport fishing.
* Good navigational access to the lake for improved boating.

Seasonally, Lake Sue experiences a major Illinois pond weed (Potamogeton illinoensis) expansion, that has caused significant navigational restrictions. As of April 27, 1989, more than one-third of the lake has been completely covered in pond weed. However, this pond weed also has many benefits, and its total elimination would be devastating to Lake Sue. It has kept the water quality and clarity stable by removing nutrients that would otherwise be available for algae. Pond weed also controls resuspension, (caused by wind and boats), of sediments and their nutrients. The pond weed and other submerged plants are helpful in preventing this resuspension by:

1. Consolidating the sediments with root material.
2. Acting as a barrier from wind, and waves.

3. Assimilating nutrients from the sediment (and water column) for plant growth.

2.3.1 Procedure To Improve Recreational Use

To improve recreational quality of Lake Sue, several options are being considered and are addressed below.

2.3.2 Mechanical Harvesting

Mechanical harvesting is a technique which cuts or mows the plant to a desired depth. It has the following advantages:

1. Selected portions of the lake can be harvested with immediate results,
2. Physically removes the vegetation that would otherwise decay in the lake,
3. Total pond weed elimination would not result.

There are also disadvantages associated with this technique such as:

1. High cost compared with spraying.
2. Heavy equipment needs access to several launching sites on the lake causing some damage to the sod and shoreline.

3. The pond weed needs to be hauled to the landfill at an additional cost.
4. The pond weed will need harvesting two or three time per year.
5. The potential for spreading the exotic plant hydrilla exists.

2.3.3 Herbicides

Herbicide treatment is also effective in controlling pond weed and other submergent and emergent macrophytes. This management practice is best used for maintenance of channels and access areas around docks. Its advantages are:

1. Inexpensive management technique.
2. Easy to apply.
3. Works quickly and well in small areas.
4. Will affect the entire plant.

The disadvantages are:

1. Herbicide use is environmentally questionable.
2. Spraying very large areas causes large amount of biomass to decay on the lake bottom releasing nutrients and increasing the biochemical oxygen demand.
3. The potential for hydrilla expansion exists.

When used properly, in conjunction with other management techniques, herbicide treatment is a very effective and useful management tool and is currently used in portions of Lake Sue.

2.3.4 Biological Control

The third technique under consideration is the use of biological control, specifically the triploid grass carp. The literature has suggested that these carp are very effective for controlling hydrilla but will graze on some native plants when available. (See Appendix A for further information on Grass Carp).

Some advantages with the use of triploid grass carp are:

1. Easy to establish in a lake.
2. Relatively inexpensive.
3. Will remove large amounts of vegetation, especially hydrilla.
4. Do not reproduce.

Some disadvantages are:

According to the Florida Game and Freshwater Fish Commission document, "Facts About Vegetation Control Using Triploid Grass Carp";

1. If over stocked, all plants can be removed, (see Clear Lake, City of Orlando) and nutrients may then express themselves in undesirable vegetation forms such as dense algae blooms.

2. Will compete with native fish for habitat by removing vegetation which contains attached organisms used as food for fish and refuge for young fish..

3. Cannot accurately predict the quantity of fish necessary for stocking the lake.

4. Will graze off desirable as well as exotic plants.

At the present time, the grass carp will not be used for plant management but may be considered for use in the future.

2.3.5 Selected Plan

In summary, the following steps have been proposed to improve the recreational quality of Lake Sue.

Step 1 Remove the pond weed by either herbicide or harvesting to open up corridors and boat channels to allow access to open water.

Step 2 When the pond weed has been cleared and the sediment is exposed, encourage the growth of Nitella spp, which is a slow growing, already present aquatic plant. If successful, it may inhibit the re-establishment of pond weed in these open channels. Monitor these areas closely for the presence of hydrilla.

2.4 Objective 3 - Nutrient Abatement

The single most important objective is nutrient abatement. The City of Orlando is currently in the forefront of this activity by addressing our serious stormwater problems. The City has proposed to redirect some of their stormwater away from Lake Rowena, however, this is probably one year away. It is very important that we continue to stress the redirection of stormwater away from the lakes in the upper Howell Branch Drainage Basin. It is likely that the Florida Legislators will pass the Stormwater Utility Bill this session which will allow the county and city to generate funds for stormwater sewer retrofitting.

2.4.1 Procedure For Nutrient Abatement

The Lake Sue Advisory Board should maintain a strong political lobby so that when funds become available, Lake Rowena and Lake Sue have some priority status. The City of Orlando will also need to address the redirection of the Colonial Mall runoff by establishing a timetable for completing this project.

In the meantime, in-lake nutrient abatement is best accomplished by the rooted vegetation in Lake Sue. As previously discussed, this vegetation helps reduce the resuspension of sediments and the release of nutrients. Mowing the pond weed will account for a minimal amount of nutrient removal, but should account for some. By maintaining the pond weed along the shoreline, in conjunction with the revegetation program, erosion will be slowed and some nutrient control may be recognized.

2.5 Objective 4 - Educate the Homeowners

Another objective of the group is public education. Initially, the residents living on Lake Sue and the surrounding neighborhood, would be educated in lake management, runoff control and revegetation. This education is important for total resident support of the project and in accomplishing our ultimate objective.

2.5.1 Procedure for Educating Homeowners

1. Distribute a summary of our proposed pilot project to each homeowner in the association.

2. Have a selected group approach each resident to discuss the proposed project and how it will affect them.
3. Obtain their support in writing by having each resident sign a document acknowledging their acceptance.
4. Hold a public meeting for the residents only if requested by the association.

SECTION 3

LAKE SUE WATER QUALITY STUDY

3.1 Introduction

Lakes Rowena and Sue are located in the upper portion of the Howell Branch Drainage Basin in urban Orlando. Due to years of stormwater disposal into this drainage basin, nutrient loading has reached a level that is causing a change in the trophic state of the lakes within the basin. In response to the increase in nutrients, these lakes are experiencing an increase in productivity.

Historic data on these lakes are poor, but residents who have lived on Lake Sue for 30 years, describe these lakes as once being crystal clear with sandy bottoms and no aquatic plant problems. It is fair to assume that the current trophic state is a result of stormwater input from urbanized Orlando. The Lake Sue Improvement Association was formed in response to this degradation of Lake Sue and Rowena. Past management practices used in the Winter Park Chain of Lakes has resulted in algae blooms and stressed biological health. The decline of the Winter Park lakes can be attributed in part to the elimination of the emergent and submergent macrophytes along with an increase in nutrient loading.

In January 1988, Grove Scientific Company was contracted to provide technical support and direction to the association, with the ultimate goal of protecting Lake Sue from further degradation. The partially responsible parties undertook a quarterly water quality and benthic invertebrate monitoring program. This was undertaken by:

1) The Lake Sue Improvement Association - represented by Grove Scientific Company
2) The City of Orlando Bureau of Streets and Drainage - Lake Enhancement Coordinator
3) Orange County Environmental Protection Department

The purpose of this program is to monitor the seasonal variations of both water quality and benthic macroinvertebrate diversity. These data will ultimately be used to track water quality trends and the trophic state of these lakes.

3.2 Procedures

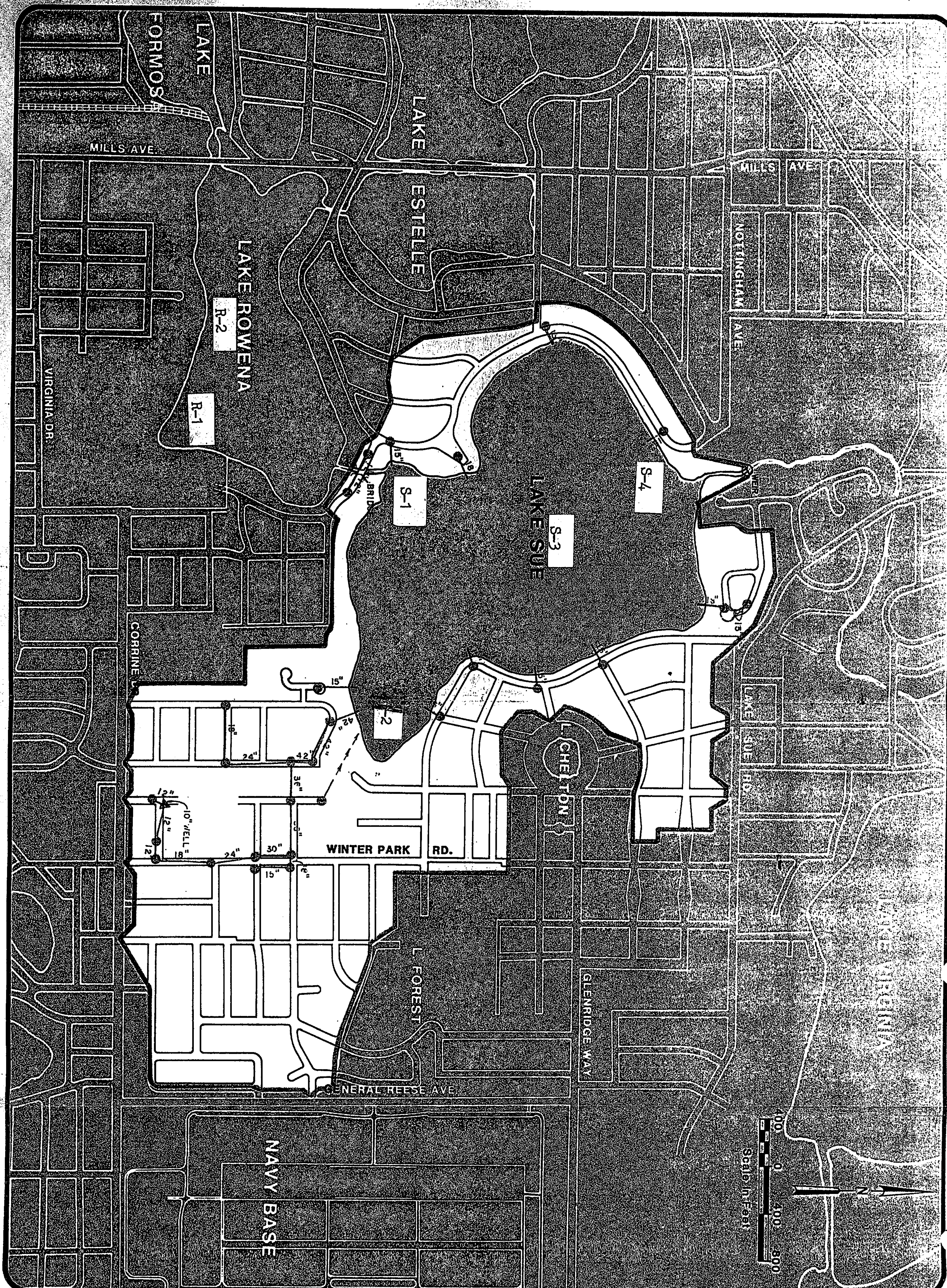
Quarterly, Grove Scientific Company and the City of Orlando conducted in-situ water quality measurements and collected mid secchi depth water samples. These samples were collected at two stations in Lake Rowena (R-1, R-2) and at four stations in Lake Sue (S-1, S-2, S-3, S-4). (See Figure 3-1). Water samples are collected with a vertical alpha bottle. In-situ measurements are collected simultaneously with a submersible Hydrolab and Y.S.I. instruments. The data are presented in Appendix B. Water samples are placed on ice and delivered immediately to the contract laboratory for analysis within their specified holding times.

The Orange County Environmental Protection Department (O.C.E.P.D.) independently collects quarterly water and semi-annual benthic macroinvertebrate samples. Water samples are collected at the approximate center of the lakes corresponding to stations R-2 and S-3 referenced above. Benthic samples are collected using an eckman dredge, then sieved on site through a 30 mesh screen. Samples are refrigerated, then sorting begins promptly back in the laboratory.

Water samples are collected directly into sample containers near the surface and in-situ measurements are collected with a Hydrolab meter. These samples are then analyzed by O.C.E.P.D.'s laboratory.

3.3 Results

Water quality results are presented in Table 3-1 for Lake Rowena



OUSWMM

LAKE SUE
SJ-HB-20

LAKE AREA	146 AC.
BASIN AREA	437 AC.

EXHIBIT 104

Figure 3-1: Water Quality Sampling Stations on Lakes Sue and Rowena

source: Dyer, Riddle, Mills & Precourt

Table 3-1
Seasonal Comparison of Chemistry Data for Lake Rowena

Date Site	02/01/88 OC	4/20/88 R-1	4/20/88 R-2	8/4/88 R-1	8/4/88 R-2	8/15/88 OC	10/18/88 OC	11/8/88 R-1	11/8/88 R-2	2/1/89 OC	3/15/89 R-1	3/15/89 R-2
pH, S.U.	7.3	7.30	7.50	7.45	7.65	6.90	7.30	5.90	6.90	6.80	8.10	8.40
Alkalinity, Total as $CaCO_3$,mg/l	71.0	60.0	60.0	48.0	46.0	51.0	71.4	22.0	45.0	50.0	60.0	58.0
Total Phosphorus as P, mg/l	0.062	0.062	0.029	0.064	0.060	0.052	0.062	0.038	0.055	0.052	0.032	0.035
Ortho Phosphate as P,mg/l	-----	0.009	0.018	<0.005	<0.005	<0.02	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Total Nitrogen as N,mg/l	0.032	0.76	0.68	1.02	1.00	0.36	0.47	0.85	0.87	0.15	0.67	0.52
Ammonia Nitrogen as N,mg/l	<0.04	0.089	0.036	<0.02	0.040	0.14	0.03	0.11	0.06	<0.01	0.03	<0.02
Nitrate Nitrogen as N,mg/l	0.027	0.06	0.08	0.061	0.056	0.049	0.019	<0.05	<0.05	0.015	0.05	<0.05
Nitrite Nitrogen as N,mg/l	<0.01	<0.005	<0.005	<0.005	<0.005	<0.01	<0.01	<0.005	<0.005	<0.01	<0.005	<0.005
Total Kjeldahl Nitrogen N/mg/l	0.29	0.70	0.60	0.96	0.94	0.31	0.45	0.85	0.82	0.14	0.62	0.52
Total Suspended Solids,mg/l	1.5	<0.50	2.0	4.8	4.5	7.5	8.0	5.0	3.5	2.5	2.2	1.5
Volatile Suspended Solids,mg/l	----	<0.50	<0.50	4.0	4.5	----	----	4.2	2.5	----	2.2	1.5
Total Dissolved Solids, mg/l	123	127	127	104	102	106	100	96	92	103	109	112
Fecal Coliform per 100 ml	24E	145	54	118	102	310	2	144E	340	18E	34E	<2
Chlorophyll - a,mg/m^3	21.1	12.5	13.4	18.0	38.0	51.6	50.9	28	31.0	16.4	16	18.
Total Coliform per 100ml	60	3300	4500	----	----	660E	58	----	----	26E	----	----

Samples R-1 through R-2 are at Mid Secchi depth.

Samples OC are taken by Orange County at Mid depth.

E = Less than statistically valid number of colonies and/or greater than 200 colonies on plates counted.

Table 3-2
Seasonal Comparison of Chemistry Data for Lake Sue

Date Site	2/1/88 OC	4/20/88 S-1	4/20/88 S-2	4/20/88 S-3	4/20/88 S-4	8/4/88 S-1	8/4/88 S-2	8/4/88 S-3	8/4/88 S-4	8/15/88 OC
pH, S.U.	6.5	7.71	8.38	8.41	8.25	7.20	7.00	7.95	7.90	7.0
Alkalinity, Total as $CaCO_3$,mg/l	53.0	58.0	54.0	54.0	54.0	40.0	46.0	46.0	48.0	53.0
Total Phosporus as P,mg/l	0.050	0.014	0.024	----	0.034	0.086	0.077	0.068	0.043	0.058
Ortho Phosphate-P,mg/l	---	0.003	0.014	----	0.018	<0.005	0.006	<0.005	0.006	<0.02
Total Nitrogen as N,mg/l	2.17	0.92	1.17	1.29	1.36	1.04	1.04	1.20	1.17	0.22
Ammonia Nitrogen as N,mg/l	0.04	0.14	0.062	0.37	0.35	0.015	<0.02	0.26	0.28	0.08
Nitrate Nitrogen as N,mg/l	1.85	0.07	0.29	0.22	0.26	<0.05	<0.05	<0.05	<0.05	0.03
Nitrite Nitrogen as N,mg/l	0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01
Total Kjeldahl Nitrogen as N,mg/l	0.32	0.85	0.88	1.07	1.10	1.04	1.04	1.20	1.17	0.19
Total Suspended Solids,mg/l	7.5	1.5	3.0	3.5	3.0	3.0	6.0	5.5	4.5	5.0
Volatile Suspended Solids, mg/l	----	<0.05	1.8	1.5	2.0	3.0	6.0	5.5	4.5	---
Total Dissolved Solids,mg/l	154	127	124	125	114	105	111	108	109	95
Fecal Coliform per 100 ml	>120	20	70	4	<2	102	31	18	7	130
Chlorophyll a, mg/m^3	3.9	11.7	14.2	13.4	14.0	22	26	13	22	25
Total Coliform per 100 ml	160	2400	6600	3300	3500	----	----	----	----	280

Page 1

Samples S-1 through S-4 are at Mid Secchi depth.

Sample OC are taken by Orange County at Mid depth.

E = Less than statistically valid number of colonies and/or greater than 200 colonies on plates counted.

Table 3-3
Seasonal Comparison of Chemistry Data for Lake Sue

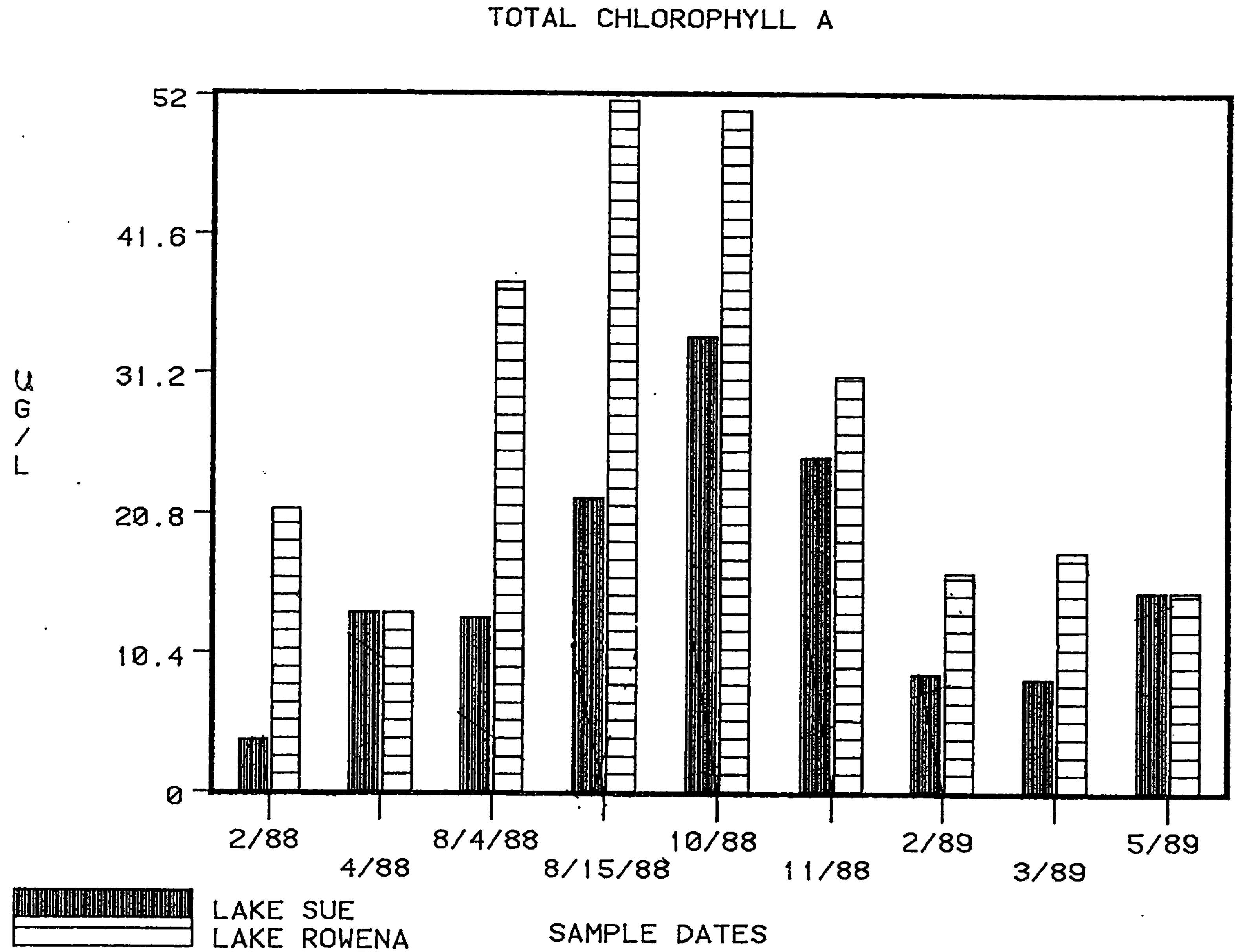
Date Site	10/18/88 OC	11/8/88 S-1	11/8/88 S-2	11/8/88 S-3	11/8/88 S-4	2/1/89 OC	3/15/89 S-1	3/15/89 S-2	3/15/89 S-3	3/15/89 S-4
pH, S.U.	7.80	6.92	7.02	7.10	6.48	7.30	7.90	8.45	8.35	8.45
Alkalinity, Total as $CaCO_3$, mg/l	57	44	44	43	36	50	53	50	48	51
Total Phosporus as P,mg/l	0.044	0.030	0.043	0.049	0.027	0.036	0.029	0.016	0.019	0.022
Ortho Phosphate P,mg/l	<0.02	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
Total Nitrogen as N,mg/l	0.34	0.75	0.70	0.73	0.79	0.17	0.53	0.37	0.39	0.30
Ammonia Nitrogen as N,mg/l	0.03	0.06	0.11	0.10	0.10	<0.01	<0.02	<0.02	<0.02	<0.02
Nitrate Nitrogen as N,mg/l	0.02	<0.05	<0.05	<0.05	<0.05	0.01	<0.05	<0.05	<0.05	<0.05
Nitrite Nitrogen as N,mg/l	<0.01	0.010	0.006	0.007	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005
Total Kjeldahl Nitrogen as N,mg/l	0.32	0.74	0.69	0.72	0.79	0.16	0.53	0.37	0.39	0.30
Total Suspended Solids,mg/l	5.5	5.0	6.0	6.0	5.0	1.0	1.5	1.5	<0.5	0.5
Volatile Suspended Solids, mg/l	----	4.0	4.0	4.0	3.0	----	1.5	1.5	<0.5	0.5
Total Dissolved Solids,mg/l	106	87	92	101	109	108	103	105	101	103
Fecal Coliform per 100 ml	2E	58	44	56	18E	2E	16E	6E	8E	6E
Chlorophyll a, mg/m^3	34	21	26	25	20	8.8	18	6.6	8.5	6.4
Total Coliform per 100 ml	32E	----	----	----	----	24E	----	----	----	----

Samples S-1 through S-4 are at Mid Secchi depth.

Samples OC are taken by Orange County at Mid depth.

E = Less than statistically valid number of colonies and/or greater than 200 colonies on plated counted.

Figure 3-3.1: Comparison of Lakes Sue and Rowena Seasonal Trends of Chlorophyll a



and Tables 3-2 and 3-3 for Lake Sue. Lake Rowena's data is presented only because this lake is upstream of Lake Sue and could have some influence on its water quality.

For this reason, the project team decided it is important to monitor both lakes and eventually apply the best management techniques to each lake.

3.3.1 Chlorophyll a

Figure 3-3.1 is a comparison of chlorophyll a levels in both lakes from February 1988, to May 1989 based on samples collected at the water quality stations located in the approximate center of each lake. The data indicate that Lake Rowena experiences consistently higher chlorophyll a levels than Lake Sue. This may be attributed to the fact that Lake Sue supports a much larger submerged macrophyte population.

Both lakes follow typical seasonal trends; lower chlorophyll a (or suspended algae) in the winter, increasing significantly during summer, then decreasing as winter approaches. Though this seasonal trend is typical of mesotrophic or eutrophic lakes, it does indicate that excess nutrients in the system are being utilized in the production of suspended algae and could eventually result in problem algae blooms.

3.3.2 Phosphorous

Is this cyclic chlorophyll trend a result of increased nutrient loading? Figure 3-3.2 compares the total phosphorous levels in each lake seasonally. The phosphorous data does indicate that levels tend to be higher during August, then decrease slightly towards winter, but there is not enough data to draw any firm conclusions.

The literature indicates that increased nutrient loading and photoperiod can cause a stimulation of algae production. Central Florida experiences increased rainfall in the summer along with increased photoperiod and temperature, all of which can influence algae growth.

The phosphorous levels are representative of eutrophic systems (Patrick L. Brezonik, North American Lake Management, 1984) for most of the year. It is likely that the hydrosoil is nutrient rich and, due to the low dissolved oxygen content in the deeper part of these lakes, phosphorous is recycled back into the water column.

3.3.3 Nitrogen

Nitrogen concentration appears to be higher in Lake Sue than Lake Rowena in 1988, then visa versa in 1989 (see Figure 3-3.3)

Figure 3-3.2: Comparison of Lakes Sue and Rowena Seasonal Trends of Total Phosporus

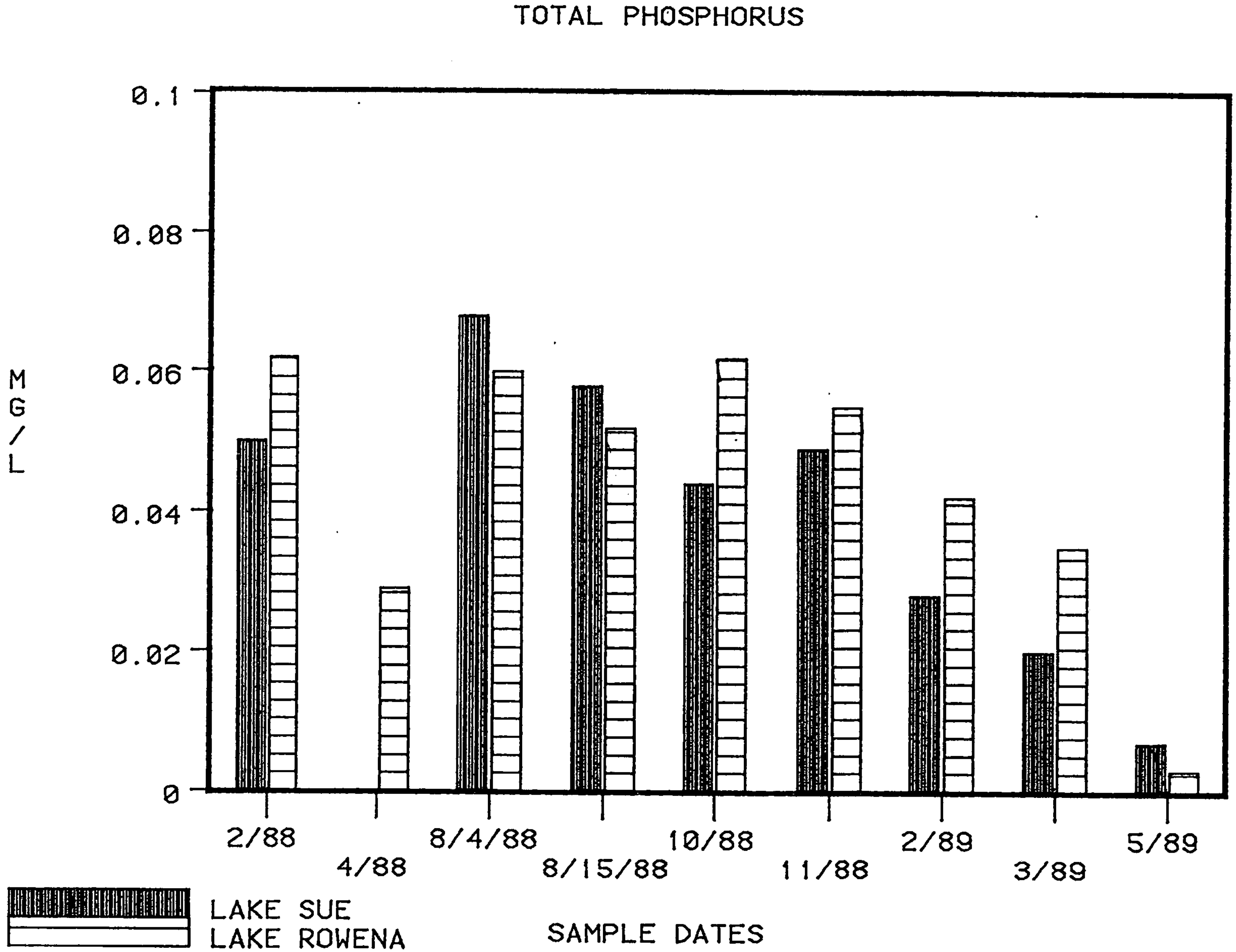
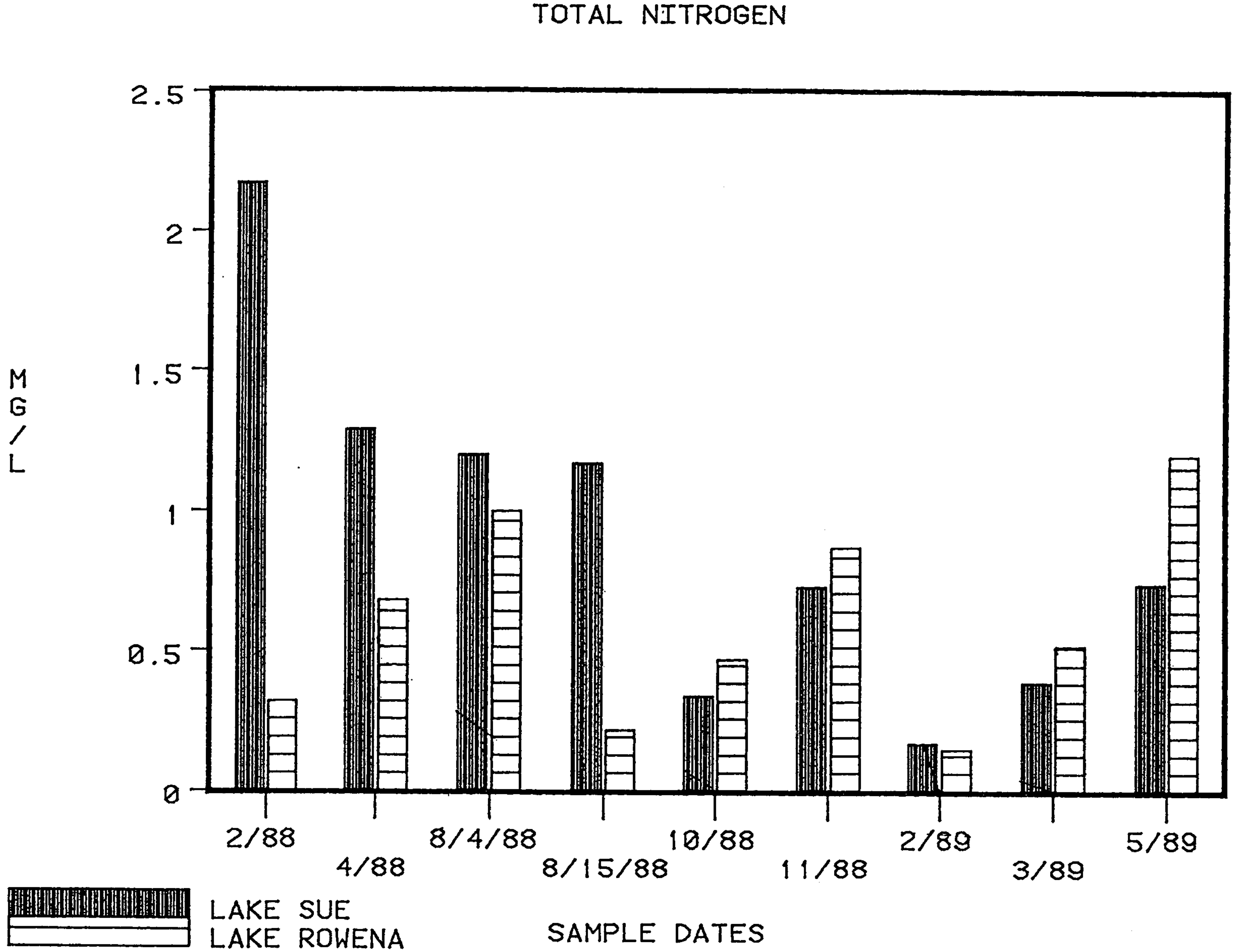


Figure 3-3.3: Comparison of Lakes Sue and Rowena Seasonal Trends of Total Nitrogen



Again we do not have enough data to draw any firm conclusions. In Lake Sue, nitrogen concentrations appear to decrease towards summer, possibly in response to the active growth of macrophytes while in Lake Rowena, which supports a much smaller macrophyte population, the nitrogen concentration appears to cycle twice per year.

3.3.4 Nutrient Balance

Lakes with a TN/TP ratio between 10 and 30, exhibit relatively well-balanced nutrition, and it is not possible to assign a single limiting nutrient to such lakes (Patrick L. Brezonik, North American Lake Management Society, 1984). According to Brezonik, such lakes respond to changes in loading and concentration of either nitrogen or phosphorous and thus, it is appropriate to relate chlorophyll a levels to either nutrient. Table 3-4 presents the nutrient balance state for both lakes.

Table 3-4

Nutrient Balance

Date	TN/TP (nutrient status) Lake Sue	Lake Rowena
2-1-88	43 - Phosphorous limiting	0.5 nitrogen limiting
4-20-88	50 - Phosphorous limiting	17 Balanced
8-4-88	16 - Balanced	16 Balanced
8-15-88	4 - Nitrogen limiting	7 Nitrogen limiting
10-18-88	8 - Nitrogen limiting	8 Nitrogen limiting
11-8-88	20 - Balanced	18 Balanced
2-1-89	5 - Nitrogen limiting	3 Nitrogen limiting
3-15-89	18 - Balanced	18 Balanced
Average	21 - Balanced	11 Nitrogen limiting

As you can see from these data, Lake Sue appears to fluctuate from phosphorous limiting to nitrogen limiting to being balanced. Lake Rowena fluctuates between balanced and nitrogen limiting. We see this same situation in other Florida lakes but have no firm conclusions regarding this observation.

3.4 Secchi Disk Depth

Lake Sue exhibited good water clarity during most of 1988, but degraded in the fall and winter. This trend can be largely attributed to the large submerged macrophyte population in Lake Sue. The pondweed was very healthy as late as September, 1988. In February and March secchi depth improved significantly then degraded as summer approached.

Lake Rowena follows a similar trend but consistently exhibits poorer water clarity (see Figure 3-4).

3.5 Trophic State Index (T.S.I.)

T.S.I. values were calculated using the method described by Patrick L. Brezonik's paper "Trophic State Indices: Rationale for Multivariate Approaches", North American Lake Management Society Proceedings, 1984. The project team is in full agreement for using this approach (see Figure 3-5).

Both lakes demonstrate classic T.S.I. trends and are mesotrophic to eutrophic from winter to summer. For the most part, both lakes can be considered eutrophic as an average trophic state.

This indicates that these lakes will exhibit high productivity, occasional algae blooms, decreasing water clarity, some algae scum and heavy macrophyte growth, (Harper, Livingston and Pearce, North American Lake Management Society, November 1987). Both lakes do periodically exhibit these characteristics and these

Figure 3-4: Comparison of Lakes Sue and Rowena Seasonal Trends of Secchi Disk Depth

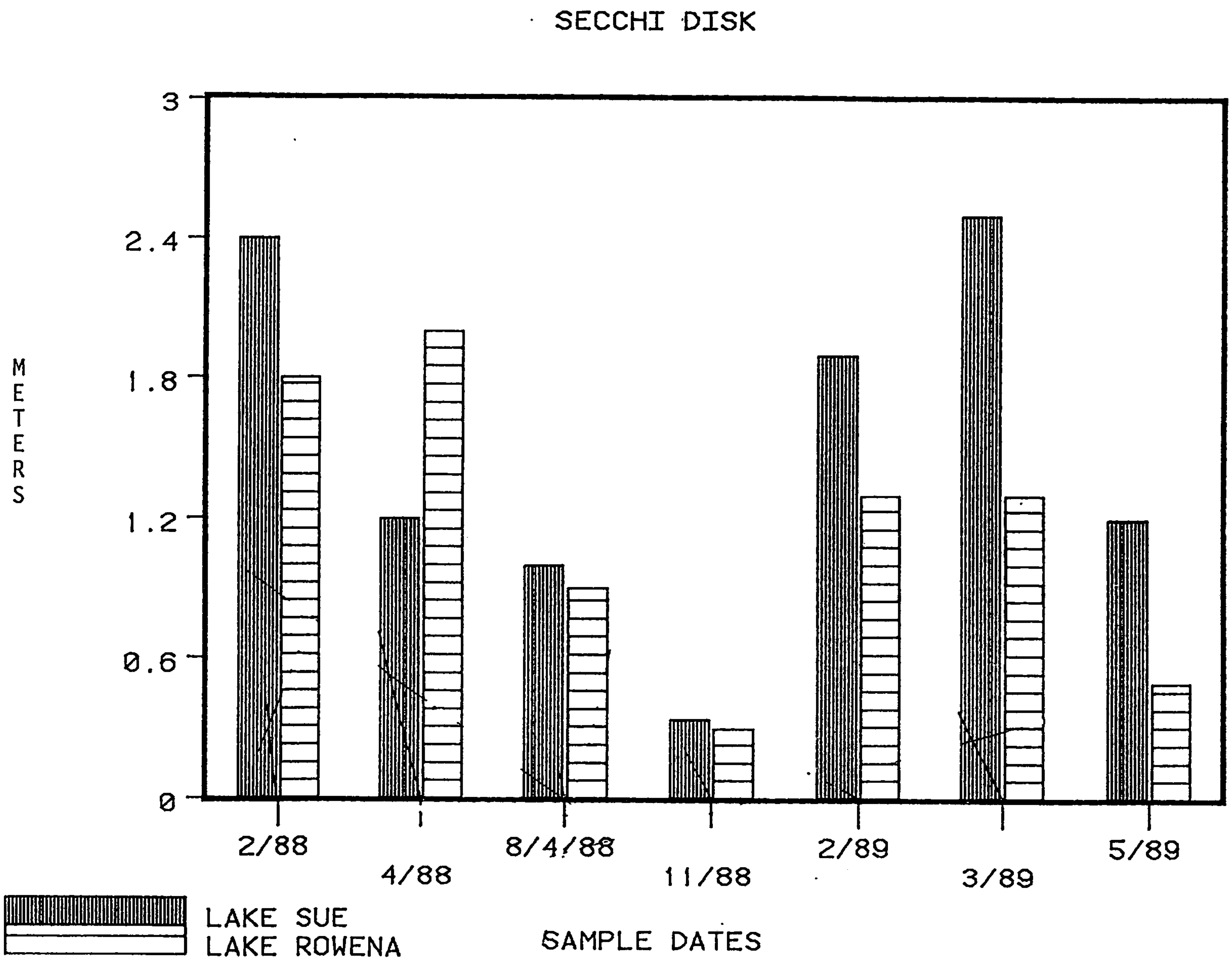


Figure 3-5: Comparison of Lakes Sue and Rowena Seasonal Trends of Trophic State Indices

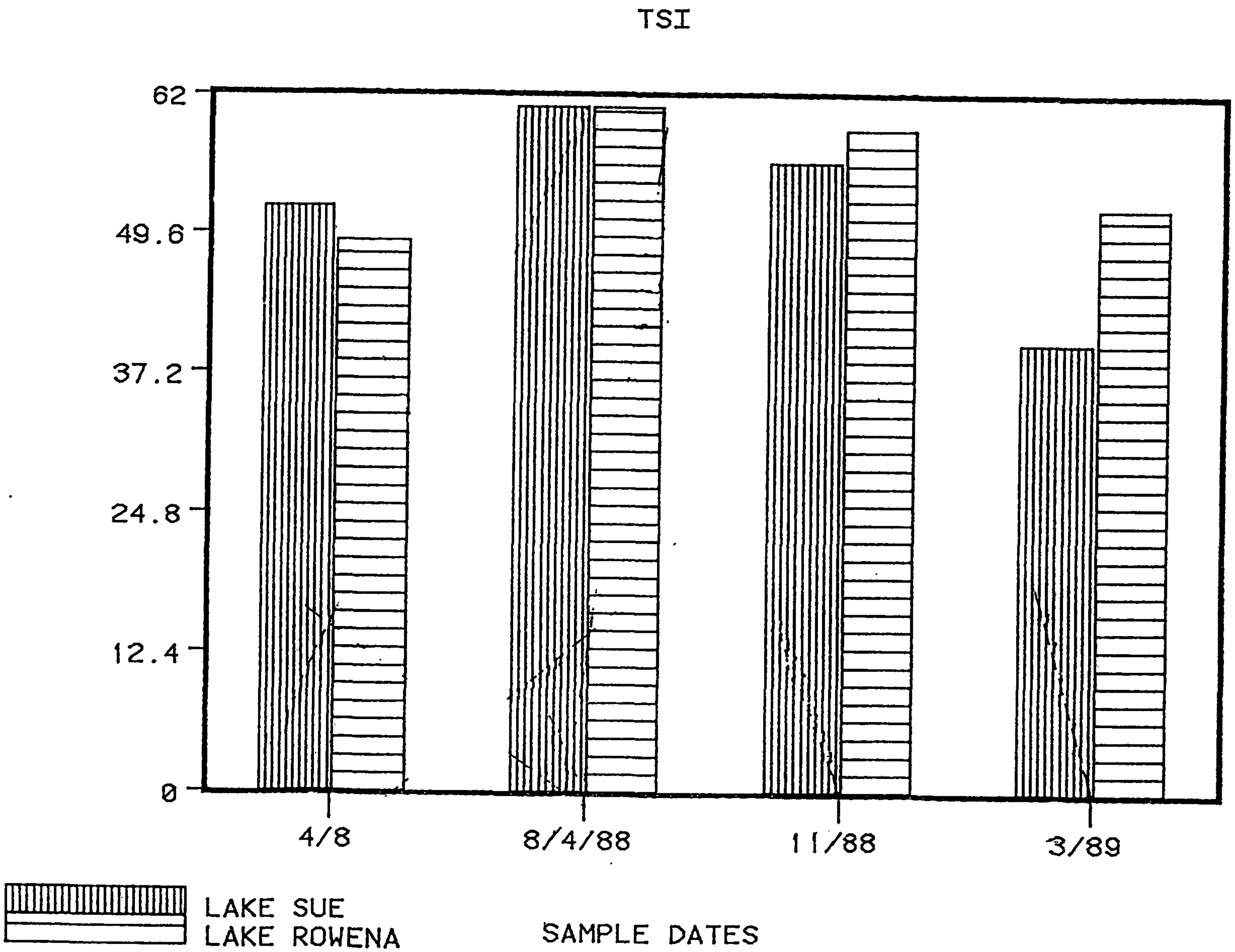
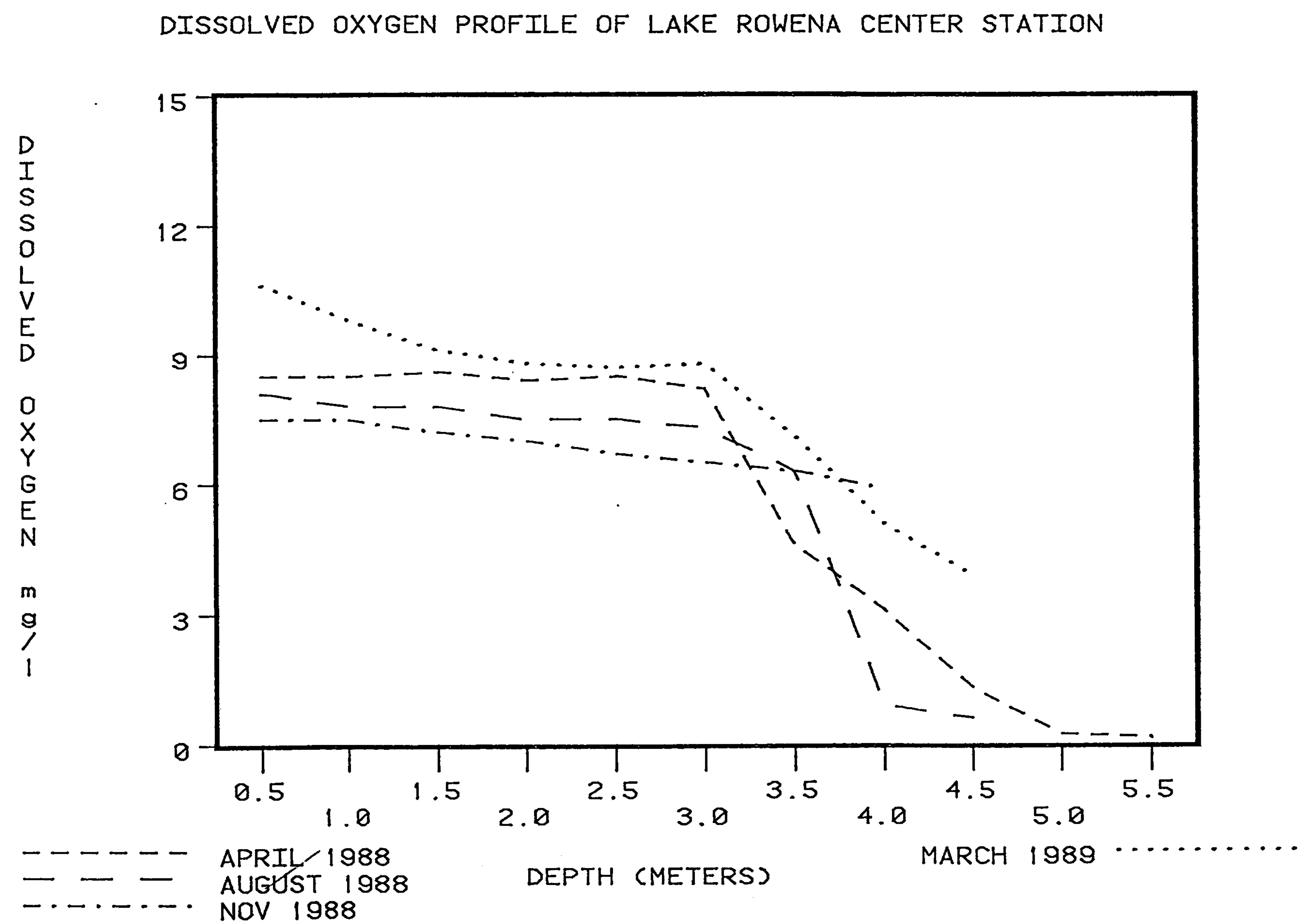


Figure 3-6.2: Seasonal Trends of Dissolved Oxygen in Lake Rowena



which indicate the lake can support more sensitive organisms. These Class II species were found in the sandy substrate (3-S), the rest of the stations were high organic mucks with decaying plant matter.

The raw data is presented in Appendix D.

Table 3-5

Shannon Weaver Diversity Index

	Lake Rowena		Lake Sue			
Date	R-1	R-2	S-1	S-2	S-3	S-4
4-20-88	0.879	2.307	0.847	1.842	0.859	1.339
8-4-88	0.169	0.579	0.734	1.566	1.413	2.961
3-20-89	1.853	0.854	0.927	1.253	1.591	eliminated

Diversity Index Ranges
0-1 indicates a grossly polluted system
1-3 indicates a moderate level of pollution in system
>3 indicates a clean water system

3.10 Rainfall Data

Rainfall data is presented in Table 3-6 and represents the total recorded rainfall for the 7 days prior to a sampling event.

Table 3-6

Rainfall Data for Orlando, Florida

Week Of	Rainfall (inches)
2-01-88	0
4-20-88	0
8-04-88	2.27
8-15-88	0.14
10-18-88	0.02
11-8-88	1.06
2-01-89	0
3-15-89	0

3.11 Conclusion

It appears from the in-situ and analytical data, that Lake Sue and Lake Rowena are eutrophic. Nutrient levels are high and Dissolved Oxygen levels are low in the hypolimnion. We can assume that the nutrient rich hydrosoils are releasing phosphorous into these lakes adding to the production of algae in the warm seasons.

Reversing the cultural eutrophication may be impossible simply by eliminating the stormwater input into just these lakes. However, through the use of various lake management techniques and stormwater control, we should eventually slow the eutrophication process and stabilize the system.

SECTION 4

REVEGETATION AND MACROPHYTE MANAGEMENT PROCEDURES AND COSTS

4.1 Introduction

Section 2 describes the value of macrophytes in controlling algae blooms in Lake Sue. These macrophytes respond to nutrient loading by an increase in biomass. Excessive submergent plant growth has been a problem over the last two years with Illinois Pondweed and, more recently, hydrilla causing navigation and recreation restrictions.

This plant population is an important filter and fisheries habitat but if uncontrolled can cause fisheries imbalance and further recreation restrictions (N.A.L.M.S, Lake Line, July 1989). The solutions are summarized as follows:

1 - Control submergent marophyte growth through a series of lake management techniques as described in Section 2,

2 - Revegetate the shoreline with native aquatic plants,

3 - Control nutrient input from external sources.

4.2 Macrophyte Control

In Section 2, we described briefly the techniques we will consider for controlling submerged macrophytes. On August 3 and 4, 1989, O.C.E.P.D. selectively treated portions of Lake Sue with the herbicide Aquathol, in an attempt to control the rapidly spreading exotic hydrilla. Hydrilla is intermingled with the pondweed and coontail. Also, the City of Winter Park treated an additional 10 acres with Sonar in an attempt to control hydrilla. It is possible that hydrilla will rebound next spring and further treatment may be necessary. It is difficult to accurately predict which plants will dominate Lake Sue next year, but we will monitor the lake closely.

The Game and Freshwater Fish Commission staff biologists have been contacted to evaluate the possibility of introducing triploid grass carp at low rates into Lake Sue, in an attempt to check the hydrilla growth. The cost for triploid grass carp are $4.00 - $6.00 per fish (plus transportation) depending on their size.

Funding for aquatic plant management comes from taxes generated by both the Orange County and City of Winter Park residents. For the Orange County portion of the lake this accounts for $25,000 in usable funds. For Winter Park, the funding comes out of the general city account and is not lake specific.

Orange County and Winter Park, in cooperation with the D.N.R., will continue an active macrophyte control program on Lake Sue using the funds described above.

4.3 Revegetation of Shoreline

The local D.N.R., aquatic plant biologists Judy Ludlow and Dean Barber, conducted vegetation surveys of Lake Sue on August 22, 1988 and March 29, 1989. The results of these surveys is included in Appendix E. Both native and exotic submergent and emergent species were identified.

Some native emergent species include pennyworth (<u>Hydrocotyl</u> spp.), water primrose (<u>Ludwigia</u> spp.), yellow water lily (<u>Nuphar luteum</u>), maidencane (<u>Panicum hemitomon</u>), smartweed (<u>Polygonum</u>

spp.), pickerelweed (Pontederia cordata), willows (Salix spp.), cattails (Typha spp.), soft rush (Juncus effesus) and duck potato (Sagittaria lancifolia).

These species vary in their value as wildlife habitat and are not present in large numbers (with the exception of Typha spp.) When possible, the larger stands of native plants will be left undisturbed. The remaining shoreline will be revegetated.

Lake Sue has a potential littoral zone that extends approximately 10 to 20 feet from the shoreline. Much of the sediments along the shore are firm sandy substrates mixed with organic matter. We are recommending that the shoreline be revegetated with the following plants:

- Giant bulrush (Scirpus californicus)
- Maidencane (Panicum hemitomon)
- Pickerelweed (Pontederia cordata)
- Duck potato (Sagittaria lancifolia)
- Bald cypress (Taxodium distichum)
- Iris hecagona (Iridaceae lacagona)
- Canna (Canna flaccida)

These species represent a balanced combination of emergent littoral macrophytes known to constitute desirable fisheries habitat.

It is the intention of this project to revegetate a portion of each property on Lake Sue. Consideration of each dock location, existing desirable littoral vegetation and bathymetry will be made prior to establishing the individual planting areas.

4.4 Typical Planting Scheme

The D.N.R. has prepared a permit application for the Lake Sue revegetation project (see Appendix F). Attached to this application is a sketch of a "Typical Planting Scheme". There are 98 individual properties around the lake. Almost every property has a boat dock, and several properties have seawalls. Slight changes to this planting scheme will occur on a site specific basis and based on the availability of plants.

The D.N.R. permit will be issued to the Lake Sue Improvement Association and applies to each riparian homeowner. It will address specific acreage of plants that can be removed from all of the lakefronts combined. Each riparian owner may maintain an access corridor, not to exceed 30 feet in width extending from shore to open water free of the permitted plants.

The remaining shoreline will be planted with the native plants referenced in this section and will have to follow the conditions of the permit.

- One hundred percent (100%) of the referenced exotic species can be removed from each lakefront lot and this area must be replanted with native aquatic plants.

- If cattails cover more than 50% of a lakefront lot, then 70% of these cattails can be removed and this area must also be replanted with native aquatic plants. Thirty percent (30%) of the cattails must remain along these lakefronts.

- Up to 30 feet of a lots' shoreline can be maintained as a cleared beach or 20%, whichever is greater.

4.5 Revegetation Procedure and Cost

Selective areas of each property will be staked-off using input from the lot owner to determine which area will remain cleared. The property owner will also be given a choice of plants or planting designs that are specific for the conditions encountered at that lot. This should be accomplished no later than November 15, 1989.

Next , the shoreline will be treated with a selected herbicide in accordance with the permit conditions. The herbicides under consideration are Aquathol, Rodeo, 2,4-D and Diquat followed by final hand removal prior to revegetation. Up to three herbicide treatments may by required from November through February, 1990, in-order to control unwanted plants.

The current plan is to have the Orange County Environmental Protection Department and the City of Winter Park aquatic weed experts apply the herbicide treatment. This would be the most practical use of funds and resources. The following acreages have been estimated by the D.N.R. for herbicide treatment:

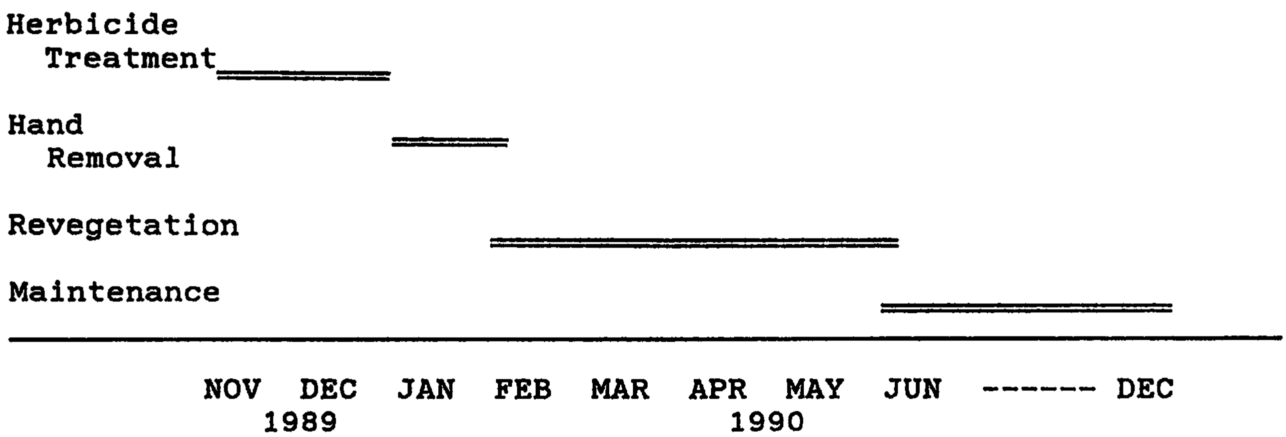
	Species	Acres	Herbicide Costs by O.C.E.P.D. (Dollars)
*	Torpedograss	3.0	1530.00
*	Elephant ear	1.0	270.00
*	Alligatorweed	1.0	270.00
*	Primrose willow	1.0	270.00
*	Cattail	1.0	270.00
*	Knotgrass	0.5	135.00
	Total	7.5	$2745.00

The labor cost for the three herbicide applications is approximately $1,000.00 for a total cost of $3745.00 (round-up to $4,000.00 for contingencies).

The revegetation contractor will be responsible for hand removing the vegetation after the plants have died and partial decay has occurred. We want to attain the full benefit of the herbicide treatment and be assured that the root systems are dead before commencing with the revegetation. Hand clearing should be completed by the last week in January, 1990 so that revegetation can start during the first week of February, 1990. Figure 4-1 represents a schedule for completing the revegetation project.

Figure 4-1

Schedule for Revegetation Completion



Approximately 7.5 acres of total area will be revegetated. Lake Sue is 11,500 linear feet around the shore and approximately 70% will be revegetated. The minimum planting will be in 3 rows at 2 foot centers, or in clusters no less than 50% of the revegetation area. Therefore:

(11,550 ft)(0.7)(3 rows) = 24,150 linear feet of planting
Plant on 2 ft. centers = 12,075 plants

Competitive prices have been obtained for some of the native plant species. The prices are presented in Table 4-1 and the formal price quote is attached in Appendix G.

Table 4-1

Prices for Container Grown Native Plants

Plant Species	Price/Plant
Giant Bulrush (*Scirpus californicus*)	0.58
Maidencane (*Panicum hemitomon*)	0.58
Pickerelweed (*Pontederia cordata*)	0.46
Duck Potato (*Sagittaria lancifolia*)	0.46
Bald Cypress (*Taxodium distichum*)	0.60
Iris (*Iridaceae hecagona*)	0.48
Canna (*Canna flaccida*)	0.46
Average	0.52

Based on the average price, the cost of purchasing the plants is $6,279.00. As a worst case, plants should not cost more than $8,000.00 to purchase from a quality nursery.

Clearing the dead vegetation is expected to take no more than 4 weeks with a four man crew or 640 manhours. At a multiplied cost of $10 per manhour, the cost for labor should be approximately $6,400.00. Including direct expenses, management, and contingencies, a cost of $10,000.00 is reasonable.

A four man crew should also be able to plant a minimum of 1,000 plants per eight hour day or complete the revegetation of Lake Sue in 384 manhours. At a multiplied cost of $10 per manhour, the cost for labor should be approximately $3,840.00. To account for direct expenses, management and contingencies, a cost of $5,000.00 is reasonable.

Year maintenance is estimated in a similar manor as planting, or a cost of $5,000.00 for the year. The total minimum cost for the proposed revegetation project is therefore:

Herbicide Treatment	=	$4,000.00
12,075 Plants	=	$8,000.00
Shoreline Clearing	=	$10,000.00

Planting	=	$5,000.00
Maintenance for first year	=	$5,000.00
	Total Estimated Cost	$32,000.00

Typical contractor prices for revegetation are approximately $3.00/plant, which includes the first year of maintenance with a guarantee. Therefore:

12,075 plants X $3.00/plant = $36,225.00

Several properties have recently been revegetated on Lake Sue at a cost of $750.00 per lot. A maximum project cost of $73,500 would therefore be anticipated based on this information. However, it is expected that the figure of $750.00 per lot would be reduced with consideration of the project size.

In summary, the estimated cost is between $32,000.00 to $45,000.00, with a maximum of $73,500.00 to complete the revegetation is expected when this project goes for bid.

4.6 Additional Cost for Lake Management

The various project participants have already spent considerable funds on the Lake Sue/Rowena water quality and management study. These funds were spent for meetings, project management and technical support, chemical and biological analysis and in-lake treatment of macrophytes since January 1, 1988. These costs (approximated) were provided by the various participants and are listed below.

Lake Sue Improvement Association (Plus MSTU Tax)	=	$15,000.00
Orange County Environmental Protection	=	$17,200.00
City of Orlando	=	$10,274.00
City of Winter Park	=	$ 4,331.00
Total	=	$46,805.00

Based on these figures and the projected cost for revegetation, project management and continued water quality monitoring will be around $100,000.00 in-order to continue the project at the same level of effort. Monitoring of the project remains a critical part of the management of Lake Sue and must be incorporated in the cost.

As you can see from the above figures, considerable effort and funds have been spent by all project participants.

4.7 Source for Funding

The following sources will be solicited to fund the "Lake Sue Improvement and Management Demonstration Project". This landmark demonstration project would be the first multi-governmental and lakefront resident effort to voluntarily restore an urban lake shoreline to comply with D.N.R.'s Aquatic Plant Control Rule 16C-20. This project can have significant future impact on similar projects around the state.

- Lake Sue Improvement Association MSTU Tax Fund
- Florida Department of Natural Resources
- Florida Department of Environmental REgulation
- City of Winter Park
- City of Orlando
- Fish America Foundation
- U.S.E.P.A. Clean Lakes Program

This document will serve as the technical proposal when applying for grant money. For the Fish America Foundation and Clean Lakes Program, specific grant applications are required along with match funding from the other participants.

SECTION 5

STORMWATER AND NUTRIENT ABATEMENT

5.1 Introduction

The City of Orlando has recently adopted a stormwater utility to generate funds to pay for desperately needed retrofitting of the City's drainage system. A project priority list has been developed and identifies over $30 Million in capital improvements city wide.

The Lake Rowena Inflow Cleanup Project (#89-413) has been placed on this list and is a proposal for diverting a portion of the flow from Colonial Plaza into the Greenwood Urban Wetland Project. This represents only a small percentage of the total flow to Lake Rowena from City owned property.

5.2 Recommendations

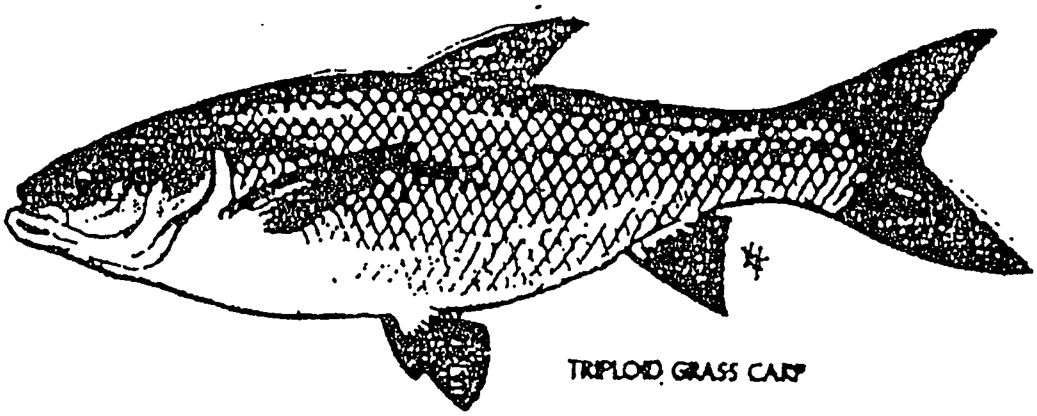
Lakes Dot, Spring, Concord, Ivanhoe, and Formosa flow into Lake Rowena. Also, Lake Winyah and Estelle flow into Rowena, which then flows into Lake Sue. All of these upstream lakes drain large portions of urban areas and Interstate 4, causing excessive pollutant loading into the upper Howell Branch system.

These lakes have been experiencing water quality degradation and their ability to assimilate nutrients is limited. However, the upper portion of the Howell Branch Basin is in better condition than the middle and lower portions. Therefore, a serious effort should be made to reduce pollutant loading into the entire upper portion.

It can be assumed that there is a significant quantity of nutrients and pollutants present in the sediments of these lakes and that internal releases will continue to be a problem for many years. However, continued loading will only compound the problem and further degrade these lakes. Ultimately, it is far less expensive to protect a chain of lakes than it is to restore them.

APPENDIX A

TRIPLOID GRASS CARP INFORMATION



Based on your inquiry, attached is information on the triploid grass carp for your review. If you have any further questions, please contact your local Game and Fish Commission or Department of Natural Resources Regional Biologist.

Table 8. Feeding preference of the grass carp on aquatic plants common to Florida.[1]

I. Greatly prefers:

Nitella and *Chara* spp.
Hydrilla verticillata
Najas spp.
Potamogeton spp.
Duckweeds (*Lemna*, *Spirodella*, *Wolffia*, *Wolffiella*, *Azolla*)
Ceratophyllum demersum
Eleocharis acicularis
Pithophora sp.

II. Will control but does not prefer:

Myriophyllum spp.
Bacopa spp.
Egeria densa
Nymphaea spp.
Polygonum spp.
Spirogyra sp.
Utricularia spp.
Cabomba spp.
Fuirena scirpoides
Brasenia schreberi
Hydrocotyle spp.

III. Will not control effectively:

Vallisneria spp.
Typha spp.
Myriophyllum brasiliense
Phragmites spp.
Carex spp.
Scirpus spp.
Eichhornia crassipes
Alternanthera philoxeriodes
Pistia stratiotes
Nymphoides spp.
Nuphar luteum

[1]Compiled by Nall and Schardt, 1977.

FACTS ABOUT VEGETATION CONTROL USING TRIPLOID GRASS CARP

Q What types of vegetation do triploid grass carp control?

A Preliminary information indicates that most submersed vegetation including hydrilla and chara are preferred plant foods of triploid grass carp. Other plant species of the duckweed group are also utilized by the triploid. Plants that may not be effectively controlled by the triploid grass carp include eelgrass, Eurasian water milfoil, smartweed, stonewart, water hyacinth, American lotus, yellow water lily, fragrant water lily, maidencane, dollarweed, alligatorweed, torpedograss and cattails.

Q How do I use triploid grass carp to achieve vegetation control?

A Triploid grass carp may be stocked directly or used in conjunction with chemical control. Recommendations cannot be made until a fisheries biologist inspects the pond site. The names and telephone numbers of persons to contact are listed at the end of this fact sheet.

Q Is a permit required prior to the application of herbicides?

A The Department of Natural Resources (DNR) is charged with the responsibility for permitting herbicides for vegetation control. You should contact a DNR botanist from one of these cities nearest you to obtain information regarding chemical aquatic plant control and permit requirements.

West Palm Beach	- - - (407) 793-5666	Tampa	- - - (813) 626-5143
Orlando	- - - (407) 423-6037		
Lake City	- - - (904) 758-0464		
Tallahassee	- - - (904) 487-2600		
Floral City	- - - (904) 726-8622		

Q How much does it cost to achieve initial control of vegetation using herbicides?

A The average cost per acre for a herbicide application is approximately $250 per surface acre.

Q How soon after herbicide treatment can I stock triploid grass carp?

A Maximum results from a herbicide treatment are achieved approximately 20 to 30 days after application. At that time, the number of triploid grass carp recommended by a fisheries biologist should be stocked.

Q What is the cost of triploid grass carp?

A The cost of triploid grass carp is about $3 to $4 each, excluding transportation. Cost of triploid is dependent upon the size of fish purchased.

Q How many triploid grass carp should I stock in my pond?

A You should stock according to the recommendation given you by a fisheries biologist. Based on the type of plants and biological productivity of your pond, he/she will make appropriate recommendations. Stocking less than the recommended number is false economy since fewer numbers generally do not result in adequate plant control. Overstocking may result in water quality problems due to over control of plants.

Q Do triploid grass carp work without the aid of initial herbicide treatment?

A Yes; however, certain conditions indicate that, for best results, triploid grass carp are most effective in controlling vegetation after the initial plant biomass is reduced with herbicides. Fewer fish may be required when used with herbicides. Over control of vegetation is less likely with fewer fish.

Q What is the annual survival rate for triploid grass carp?

A Further research is needed to answer this question; however, preliminary research findings indicate that stocking additional fish may be necessary to offset initial mortality by birds and predator species of fish.

Q What is the difference between a grass carp and a triploid grass carp?

A The most important difference is that the grass carp is capable of reproducing and the triploid grass carp is not. The Commission has been very concerned with the possibility of grass carp reproduction. Therefore, permits are not issued for its management use in Florida.

Q Has reproduction of grass carp occurred in the continental United States?

A Yes, it has spawned extensively in the Mississippi River. Commission biologists believe spawning requirements for grass carp are also found in certain Florida streams.

Q Has all the research been completed on grass carp?

A No; pond and lake investigations were initiated in 1980 and are expected to continue for several years. During this period, the Commission is making the triploid grass carp available to private pond owners for vegetation control as an alternative to expensive recurring herbicide treatments.

Q Is total control of all rooted vegetation desirable?

A No; if total control is achieved, it is probable that nutrients will express themselves in undesirable vegetation forms such as dense algae blooms. This reduces water quality and stability. Game fish populations are dependent upon vegetation for cover and are thus adversely affected by complete removal of rooted vegetation . Also, aquatic vegetation serves as an attachment source for food organisms. The complete absence of vegetation during spawning of largemouth bass generally results in very poor survival of the offspring. A body of water having algae blooms and no rooted aquatic vegetation is more likely to develop a summertime oxygen depletion, resulting in a partial or complete fish kill. A suggested rule-of-thumb is to maintain vegetation in 20 to 40 percent of the water area.

Q How do I obtain triploid grass carp?

A A list of approved commercial sources is available from Commission offices listed below. Before stocking triploid grass carp, you should contact the Commission to obtain a permit. Your pond or lake will be inspected and recommendations made relative to how many fish should be stocked, what type and how much herbicide should be applied before stocking and, if necessary, what type of fish barrier should be installed to ensure your fish do not migrate out of your pond. To receive this advice, you should contact either Lowell Trent at 904/357-6631 or Deborah Valin at 813/688-3754. The Commission does not provide triploid grass carp to private pond owners for management purposes.

GUIDELINES FOR USE OF TRIPLOID GRASS CARP
FOR AQUATIC PLANT MANAGEMENT

1. All grass carp used for aquatic plant management must be certified triploid by Florida Game and Fresh Water Fish Commission biologists. This certification consists of a ploidy check using a particle analyzer such as the Coulter Counter to verify that fish have a 3N chromosome count indicating that they are sterile.

2. Permit approval will be recommended for species of plants known to be controlled by triploid grass carp. Emergent plant species in general will not be considered for control by triploid grass carp.

3. Aquatic vegetation abundance and types within public water sites where use of grass carp is requested or recommended must be determined as problematic or potentially so by Commission personnel.

4. Biologists Lowell Trent, 904/357-6631 or Dave Eggeman 813/688-3754, must be notified by triploid grass carp shippers to arrange certification of triploid grass carp shipments.

5. Air freight shipments will arrive in either Orlando or Tampa and be sampled by Commission personnel for ploidy and size certification prior to leaving the airport. Air freight fish shipments will be certified between 8 a.m and 5 p.m. only, Monday through Friday.

6. Shipments arriving other than by air freight shall be certified as triploid at Richloam Fish Hatchery by Mr. Bob Wattendorf, 904/357-6631.

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FSH 8-2-3

39-23.08 Introduction of Freshwater Fish the Waters of the State; Provisions for Sale d Inspection of Fish for Bait or Propagation rpose; Diseased Fish

(1) No person shall transport into the te, introduce, or possess for any purpose at might be reasonably expected to result in eration into the waters of the state, any shwater aquatic organism not native to the te, without having secured a permit from e commission, except:

(a) Fathead or tuffy minnow (imephales promelas)

(b) Variable platy (*Xiphophorus riatus*)

2) Restricted fishes:

The following fishes or hybrids thereof y be possessed only under permit from the ecutive director. Prior to the issuance of h permit, the facilities where the fish are to kept and waters where their use is intended y be inspected by commission personnel to ure that adequate safeguards exist to pret escape or accidental release into the ters of the state.

(a) Bighead carp (*Aristichthys ilis*)

(b) Bony-tongue fishes (family Osteossi dae, all species)

(c) Common carp (*Cyprinus carpio*) ept colored koi

(d) Dorados (genus *Salminus*, all cies)

(e) Freshwater stingrays (family amotrygonidae, all species)

(f) Grass carp (*Ctenopharyngodon lla*)

(g) Nile perches (genus *Lates*, all ies).

(h) Pike killifish (*Belonesox beli- us*)

(i) Silver carp (*Hypophthalmichthys trix*)

(j) Snail or black carp (*Mylo- ryngodon piceus*)

(k) Tilapias [*Tilapia (Oreochromis) a. T. (O.) hornorum* and *T. (O.) sambica*]

(l) Walking catfish (*Clarias batra-*)

Prohibited fishes:

No person shall import, sell, possess or port in state any of the following live fish brids thereof:

(a) African electric catfishes (family apteruridae,all species) –

(b) African tigerfishes (subfamily ocyninae, all species)

(c) Airbreathing catfishes (family idae, all species except *Clarias batrachus*)

(d) Candiru catfishes (family omycteridae, all species)

(e) Freshwater electric eels (family rophoridae, all species)

(f) Lampreys (family Petromyzonidae, all species)

(g) Piranhas and pirambebas (subfamily Serrasalminae, all species)

(h) Snakeheads (family Channidae, all species)

(i) Tilapias [(*Tilapia, Sarotherodon* and *Oreochromis* genera) all species except *Tilapia (Oreochromis) aurea, T. (O.) hornorum* and *T. (O.) mossambica*]

(j) Trahiras or tigerfishes (family Erythrinidae, all species)

Limited exceptions to this subsection may be made for viewing at large public aquaria or for research, provided commission-approved maximum security requirements are met.

(4) Live game fish of any and all classes produced by privately owned hatcheries in privately owned ponds may be sold and transported for propagation purposes only.

(5) No person shall allow or permit any freshwater fish not native to the state to remain in the waters of any propagating pool or pond which is no longer maintained or operated for the production of such non-native species.

(6) The presence of any species designated in subsections (2) or (3) in any propagating pool or pond shall constitute possession by the owner or operator of the pool or pond.

(7) Commission personnel may inspect all hatcheries and hatchery facilities in which fish or other aquatic organisms are to be held before any permit to import said fish or other aquatic organism is issued. Costs of travel and per diem of the employee making the inspection shall be paid by the firm being inspected.

(8) Hatcheries shall be subject to inspection at any time by personnel of the commission. The operator of these hatcheries shall furnish the main office of the commission a copy of each sales slip covering fish imported, giving the species of fish sold, the number of organisms in the shipment, date of shipment, to whom they were sold, and address of the purchaser at the time of billing said purchaser, no later than five days following the shipment.

(9) Any person transporting game fish in excess of legal possession limits shall possess proof that said fish have been legally acquired and are being legally transported.

(10) No person shall possess any fish or other aquatic organism which is diseased or infected or which has been exposed to disease or parasites and which in the determination of the executive director would be detrimental to freshwater fish if released or placed in the waters of the state. Any representative of the commission may inspect all ponds, pools, vehicles and other facilities used to store or transport freshwater bait minnows or any species of fish for use as bait, for restocking or other purpose. Inspection may be made of facilities wherein foreign or non-native species of freshwater fish are propagated for any commercial purpose so as to determine that such species or their eggs are not allowed to escape into the aters of the state.

(11) All diseased or parasitized fish and fis which have been exposed to disease or para sitic conditions, or any other fish or aquati organism which may be discovered in suc ponds, pools, vehicles or other facilities an which in the determination of the executiv director would be detrimental to freshwate fish if released or placed in the waters of th state, shall be confiscated and destroyed as public nuisance.

(12) No person shall operate any facilit wherein any non-native freshwater fish a propagated for sale or any other purpos unless such facility is equipped with overflo protective devices approved by th commission to prevent the escape of the egg or young of such fish into the waters of th state.

Specific Authority: Art. IV, Sec. 9, Fla. Const., 372.021, F.S. La Implemented: Art. IV, Sec. 9, Fla. Const. History: New—8-1-7 Amended 6-21-82

APPENDIX B

IN-SITU MEASUREMENTS OF PHYSICAL PARAMETERS

LAKE SUE/ROWENA STUDY

APRIL 20, 1988

GROVE SCIENTIFIC

Site I.D.#	(ft) Sechi Depth	(M) Total Depth	(M) Depth	(PPM) D.O.	pH	(°C) Temperature	(umhos/cm) Conductivity
1-R	6.0	3.75	0.5	8.30	7.75	23.1	190
			1.0	8.34		23.1	190
			1.5	8.32		23.0	190
			2.0	8.33		23.0	190
			2.5	8.12		23.0	189
			3.0	8.00		22.9	190
			3.5	1.78		21.8	188
2-R	6.0	5.50	0.5	8.50	7.90	23.1	185
			1.0	8.48		23.1	185
			1.5	8.56		23.0	187
			2.0	8.40		22.9	188
			2.5	8.45		22.9	188
			3.0	8.22		22.7	188
			3.5	4.58		21.7	182
			4.0	3.14		21.5	181
			4.5	1.28		21.3	181
			5.0	0.23		21.3	222
			5.5	0.16		21.3	228
S-1	5.75	6.75	0.5	8.40	7.80	23.4	175
			1.0	8.51		23.1	178
			1.5	8.50		23.1	178
			2.0	8.35		22.9	178
			2.5	8.05		22.2	175
			3.0	6.99		21.9	174
			3.5	4.33		21.1	174
			4.0	2.88		20.9	174
			4.5	0.55		20.7	172
			5.0	0.28		20.6	172
			5.5	0.22		20.5	180
			6.0	0.15		20.5	220
S-2	3.0	4.75	0.5	9.54	8.55	23.5	178
			1.0	9.62		23.4	178
			1.5	9.56		23.1	175
			2.0	9.53		22.9	175
			2.5	9.27		22.8	175
			3.0	8.54		22.7	175
			3.5	4.20		21.7	175
			4.0	3.93		21.2	171
			4.5	0.25		21.0	188
S-3	4.0	4.85	0.5	9.58	8.70	23.3	171
			1.0	9.59		23.3	173
			1.5	9.59		23.3	171
			2.0	9.56		23.2	171
			2.5	9.46		23.1	173
			3.0	8.60		22.7	172
			3.5	3.88		21.4	170
			4.0	1.47		21.0	170
			4.5	0.77		20.9	178
S-4	4.0	3.85	0.5	9.16	8.65	23.6	171
			1.0	9.29		23.3	171
			1.5	9.47		23.1	171
			2.0	8.81		22.8	171
			2.5	7.20		22.5	171
			3.0	6.43		22.4	171
			3.5	4.99		22.1	172

GROVE SCIENTIFIC

[redacted]
AUGUST 4, 1988

Site	(meters) Total Depth	Depth (meters)	Dissolved Oxygen (ppm)	($umhos/cm^2$) Conductivity	Temperature (^oC)	pH	Secchi Depth (feet)
1-R	4.5	0.5	6.80	170	30.0	7.39	5.0
		1.0	6.40	180	30.0		
		1.5	6.40	180	30.0		
		2.0	6.40	180	30.0		
		2.5	6.40	180	30.0		
		3.0	6.40	180	30.0		
		3.5	5.00	180	30.0		
		4.0	4.70	180	30.0		
2-R	4.75	0.5	8.10	170	30.0	8.42	3.0
		1.0	7.80	170	31.0		
		1.5	7.80	175	31.0		
		2.0	7.50	180	31.0		
		2.5	7.50	180	30.0		
		3.0	7.30	180	30.0		
		3.5	6.30	180	30.0		
		4.0	.90	180	30.0		
		4.5	.60	180	29.0		
1-S	6.5	0.5	6.20	180	30.0	8.04	3.0
		1.0	6.00	180	30.0		
		1.5	5.80	180	30.0		
		2.0	5.70	180	30.0		
		2.5	5.60	180	30.0		
		3.0	5.20	180	30.0		
		3.5	4.90	180	30.0		
		4.0	3.50	180	30.0		
		4.5	3.20	180	28.0		
		5.0	3.00	180	28.0		
		5.5	.60	180	28.0		
		6.0	.30	180	28.0		
2-S	5.0	0.5	7.40	190	30.0		
		1.0	7.40	190	30.0		
		1.5	7.40	190	30.0		
		2.0	7.10	190	30.0		
		2.5	7.30	190	30.0		
		3.0	5.60	190	30.0		
		3.5	4.50	190	30.0		
		4.0	2.00	190	30.0		
		4.5	.90	190	29.0		
3-S	5.0	0.5	8.20	200	30.0	8.77	3.0
		1.0	8.20	200	30.0		
		1.5	8.00	200	30.0		
		2.0	7.80	200	30.0		
		2.5	7.70	200	30.0		
		3.0	6.90	200	30.0		
		3.5	5.70	200	30.0		
		4.0	4.00	200	30.0		
		4.5	1.40	200	29.0		
4-S	3.5	0.5	7.20	190	30.0	8.61	3.5
		1.0	8.10	190	30.0		
		1.5	7.50	190	30.0		
		2.0	7.30	190	30.0		
		2.5	6.10	190	30.0		
		3.0	3.40	200	29.0		
		3.5	1.30	200	29.0		

GROVE SCIENTIFIC

LAKE SUE
NOVEMBER 11, 1988

Site I.D.#	(ft) Secchi Depth	(M) Total Depth	(M) Depth	(ppm) D.O.	(°C) Temp.	(umhos/cm) Conductivity	Comments
R-1	1.06	2.5	0.5	7.50	23.0	160	Weather clear, sunny,
			1.0	7.41	23.0	160	75°F, water greenish
			1.5	7.35	22.9	159	brown color.
			2.0	7.10	22.6	159	
			2.5	6.02	22.4	159	
R-2	1.06	4.25	0.5	7.54	23.3	159	Some small suspended
			1.0	7.54	22.7	159	algae visible in
			1.5	7.18	22.5	158	water.
			2.0	6.95	22.5	157	
			2.5	6.70	22.3	157	
			3.0	6.46	22.3	157	
			3.5	6.27	22.3	155	
			4.0	5.90	22.3	155	
S-1	1.25	6.0	0.5	7.10	23.3	165	Floating algea,
			1.0	7.07	23.1	162	noted that cattails
			1.5	6.35	22.3	160	have been sprayed at
			2.0	5.88	22.1	159	canal entrance, also
			2.5	5.48	22.0	159	construction work at
			3.0	5.31	22.0	159	house on canal.
			3.5	5.19	21.9	159	
			4.0	4.99	21.9	159	
			4.5	4.98	21.9	159	
			5.0	4.88	21.9	159	
			5.5	4.90	21.9	159	
			6.0	4.90	21.8	159	
S-2	1.15	4.4	0.5	7.48	23.0	167	Very sunny
			1.0	7.53	22.8	162	
			1.5	7.50	22.6	160	
			2.0	7.20	22.5	161	
			2.5	6.93	22.4	160	
			3.0	6.70	22.4	160	
			3.5	6.55	22.3	160	
			4.0	5.50	22.2	160	
S-3	1.10	4.6	0.5	7.87	23.2	164	
			1.0	7.53	22.6	161	
			1.5	7.15	22.4	160	
			2.0	7.16	22.3	160	
			2.5	7.10	22.3	160	
			3.0	7.04	22.3	160	
			3.5	6.08	22.1	160	
			4.0	6.08	22.1	159	
			4.5	6.08	22.1	159	
S-4	1.15	3.5	0.5	8.02	23.5	164	Illinois Pond weed
			1.0	8.10	23.3	163	has gone to seed and
			1.5	8.22	22.8	161	is still visible on
			2.0	8.42	22.4	161	the surface of the
			2.5	8.01	22.1	160	water. D.O. checked
			3.0	7.56	22.0	160	over to verify high
			3.5	6.80	21.9	160	OK - pond weed in
							area, lots of ell
							grass could out com-
							pete pond weed event-
							ually - ell grass
							thick and well
							populated.

GROVE SCIENTIFIC

Site I.D #	(meters) Secchi Depth	Total Depth	(M) Depth	(M) D.O.	(ppm) P.H.	(S.V.) Temperature	(°C) Conductivity	(umhos/cm) Comments
S-1	2.25	6.10	0.5	9.9	8.17	20.5	160	Nile perch were bedding
			1.0	9.7		20.0	155	in this area on the
			1.5	10.6		19.5	150	left bank near the
			2.0	10.5		19.0	150	Lake Rowena canal.
			2.5	10.4		18.0	150	
			3.0	9.3		18.0	145	
			3.5	8.2		17.5	145	
			4.0	7.0		17.0	145	
			4.5	5.1		17.0	145	
			5.0	5.1		17.0	145	
			5.5	4.7		17.0	145	
			6.0	4.5		17.0	145	
S-2	2.75	4.50	0.5	9.9	8.21	20.5	155	Mostly sunny.
			1.0	9.5		20.2	150	
			1.5	9.2		20.0	150	
			2.0	9.2		19.5	150	
			2.5	9.1		19.0	150	
			3.0	8.7		19.0	150	
			3.5	7.7		18.5	150	
			4.0	6.5		18.0	150	
			4.5	4.2		18.0	150	
S-3	2.50	4.50	0.5	10.0	8.36	21.0	152	
			1.0	9.8		20.5	152	
			1.5	9.5		20.0	150	
			2.0	9.3		20.0	150	
			2.5	9.3		20.0	150	
			3.0	8.9		19.5	150	
			3.5	8.5		19.0	150	
			4.0	7.4		18.0	147	
			4.5	4.0		18.0	147	
S-4	2.50	3.5	0.5	10.2	8.30	21.0	151	
			1.0	10.3		21.0	151	
			1.5	10.3		21.0	150	
			2.0	10.2		21.0	150	
			2.5	10.2		21.0	150	
			3.0	9.8		20.0	150	
			3.5	8.2		20.0	150	
R-1	1.30	4.35	0.5	10.1	7.72	21.0	160	Weather partly cloudy,
			1.0	10.0		20.5	155	temperature 74°, wind
			1.5	9.6		20.5	150	3-4 mph, water a
			2.0	9.4		20.0	150	greenish color
			2.5	9.1		20.0	150	
			3.0	5.9		20.0	150	
			3.5	4.1		19.0	150	
			4.0	3.7		18.0	150	
R-2	1.25	4.45	0.5	10.6	8.07	21.0	160	Vegetation was planted on
			1.0	9.8		21.0	155	shore line near Leu
			1.5	9.1		20.5	152	Gardens. 20 different
			2.0	8.8		20.0	151	plant types were planted.
			2.5	8.7		20.0	150	The plants seem to be
			3.0	8.8		19.0	150	growing well,
			3.5	7.1		18.5	150	
			4.0	5.1		18.0	150	
			4.25	3.9		18.0	150	

GROVE SCIENTIFIC

TECHNICIAN Kevett T. Mickle
DATE 6-28-89
PROJECT # 05-009.00
CLIENT NAME Lake Sue & Rowena

Lakes Sue and Rowena
In-Situ Field Data Sheets

Site I.D. #	(M) Total Depth	(M) Secchi Depth	(M) Depth	(ppm) D.O.	(S.U.) pH	(°C) Temp.	(umhos/cm) Conductivity	Comments
R-1	3.8	0.64	0.5	9.0	8.95	30.0	180	Weather sunny, partly cloudy wind 3-4 mph. Ambient temperature 80°-85°.
			1.0	9.3		30.0	180	
			1.5	9.3		30.0	185	
			2.0	8.9		30.0	185	
			2.5	8.6		30.0	185	
			3.0	7.8		30.0	185	
			3.5	2.1		30.0	185	
R-2	4.0	0.76	0.5	9.3	8.61	30.5	180	
			1.0	9.3		30.5	181	
			1.5	8.9		30.5	181	
			2.0	8.1		30.5	181	
			2.5	7.9		30.0	181	
			3.0	6.8		30.0	181	
			3.5	3.2		30.0	181	
S-1	5.7	0.83	0.5	7.6	8.54	31.1	189	A lot of the pond weed d water was brownish-green
			1.0	5.6		30.5	185	
			1.5	4.6		30.5	185	
			2.0	4.1		30.5	185	
			2.5	2.2		30.0	185	
			3.0	1.2		30.0	185	
			3.5	0.7		29.0	185	
			4.0	0.2		29.0	185	
			4.5	0.1		29.0	185	
			5.0	0.1		28.0	185	
			5.5	0.0		28.0	185	
S-2	4.0	0.71	0.5	9.6	9.31	30.5	191	
			1.0	9.7		30.5	190	
			1.5	9.8		30.1	190	
			2.0	9.8		30.1	190	
			2.5	9.7		30.1	190	
			3.0	8.3		30.0	190	
			3.5	5.0		29.0	190	
			4.0	1.8		29.0	185	
S-3	4.4	0.88	0.5	9.0	9.25	31.0	191	
			1.0	9.6		30.5	190	
			1.5	8.9		29.6	189	
			2.0	8.8		29.6	189	
			2.5	5.8		29.5	189	
			3.0	5.0		29.1	189	
			3.5	2.2		28.9	185	
			4.0	0.4		28.5	200	
S-4	3.9	0.80	0.5	9.6	8.17	30.3	190	
			1.0	9.7		30.1	190	
			1.5	9.1		29.7	190	
			2.0	5.9		29.7	189	
			2.5	2.7		29.0	185	
			3.0	2.0		28.9	185	
			3.5	1.5		28.9	180	

APPENDIX C

ANALYTICAL DATA FOR WATER CHEMISTRY

Bionomics Laboratory, Inc.
4310 EAST ANDERSON ROAD P.O. BOX 8011 ORLANDO, FLORIDA 32812
(407) 851-2560 RICHARD ALT, PRESIDENT

June 1, 1988

FOR: City of Orlando
Bureau of Streets and Drainage
1010 S. Westmoreland
Orlando, FL 32805

Note: 1"-2" of rain day before

ATTN: David Pearce

RE: Lake Monitoring Program, samples submitted by client 4/20/88
Lake Sue

LABORATORY REPORT

LAB I.D. NO.	881807	881808	881809	881810	
MARKS	S-1	S-2	S-3	S-4	
DATE RECEIVED	4/20/88	4/20/88	4/20/88	4/20/88	Avg.
pH	7.71	8.38	8.41	8.25	
Alkalinity, Total as CaCO3, mg/l	58	54	54 NOT used	54	
Total Phosphorus as P, mg/l	0.014	0.024	0.005*	0.034	.024
Ortho Phosphate as P, mg/l	0.003	0.014	0.018	0.018	
Total Nitrogen as N, mg/l	0.32	1.17	1.29	1.35	1.19
Ammonia Nitrogen as N, mg/l	0.14	0.062	0.37	0.35	
Nitrate Nitrogen as N, mg/l	0.07	0.29	0.22	0.25	
Nitrite Nitrogen as N, mg/l	0.005*	0.005*	0.005*	0.005*	
Total Kjeldahl Nitrogen as N, mg/l	0.85	0.88	1.07	1.10	
Total Suspended Solids, mg/l	1.5	3.0	3.5	3.0	
Volatile Suspended Solids, mg/l	0.5*	1.8	1.5	2.0	
Total Dissolved Solids, mg/l	127	124	125	114	
Fecal Coliform per 100 ml	20	70	4	2*	
Chlorophyll-a, mg/m3	11.7	14.2	13.4	14.0	13.3
Total Coliform per 100 ml	2,400	6,600	3,300	3,500	

SD = 1.32

* Less than

$\frac{TN}{TP} = 50$

$\frac{TN}{TP} > 30 \therefore$ TP limited

TSI
chla = 54
SD = 52
P = 51
TSI(FLA) = 52

Signed Richard Alt
Richard Alt, Chemist

PHYSICAL - CHEMICAL PROFILES

Location: Lk. Sue Date: 4/20/82 Condition: Clear, Sunny Air Temp: 80°F

Station: S-3 Time: 12:20

Depth m	Temp °C	pH	DO mg/1	Cond. uS/cm	ORP mv	* ORP mv
0.1	23.4	9.0	9.4	197	57	373
0.5	23.3	9.0	9.2	198	57	373
1.0	23.3	9.0	9.1	198	58	374
2.0	23.1	8.9	9.0	199	60	370
3.0	22.4	8.2	6.1	201	75	345
4.0	21.1	7.2	1.4	206	115	327
4.4(B)	21.0	7.0	1.0	210	10	210
3.5*	21.3	7.2	3.5	202	42	254

Secchi Disk Depth: 1.30

Station: S-4 Time: 12:35

Depth m	Temp °C	pH	DO mg/1	Cond. uS/cm	ORP mv	* ORP mv
0.1	24.1	8.9	8.8	195	46	356
0.5	23.8	8.9	8.5	197	45	355
1.0	23.3	8.9	8.7	198	45	355
2.9(B)	22.9	8.8	7.8	197	50	354
1.5*	22.9	8.9	8.5	193	46	356

Secchi Disk Depth: 1.37

*Corrected: $\overset{*}{ORP}$ = ORP + 200 + (pH-7)58

PHYSICAL - CHEMICAL PROFILES

Location: Lake Sue   Date: 4/20   Condition: Sunny/Warm windy, ~~avg~~ NE   Air Temp: 78

Station: S-1   Time: 11:[illegible]

Depth m	Temp °C	pH	DO mg/1	Cond. uS/cm	ORP mv	* ORP mv
0.1	23.2	8.6	8.4	202	76	369
0.5	23.[illegible]	8.6	8.3	202	78	371
1.0	23.0	8.4	8.0	202	81	362
2.0	22.7	8.3	7.8	204	80	361
3.0	21.6	7.6	5.6	205	109	344
4.0	21.0	7.1	2.4	207	126	332
5.0	20.7	6.9	0.7	207	-99	95
5.4B	20.6	6.7	0.4	210	-160	23

Secchi Disk Depth: 1.42 m

Station: S-2   Time: 11:55

Depth m	Temp °C	pH	DO mg/1	Cond. uS/cm	ORP mv	* ORP mv
0.1	23.5	9.0	9.3	199	50	366
0.5	23.5	9.0	9.2	199	50	366
1.0	23.3	9.0	9.2	199	51	367
2.0	22.9	8.9	8.9	200	54	364
3.0	22.8	8.9	8.5	199	55	365
4.0	21.2	7.2	2 0	205	129	321
4.2B	21.0	7.0	1.3	207	101	301
3.5*	21.2	7.2	4.7	203	83	295

Secchi Disk Depth: 1.20

*Corrected: $\overset{*}{ORP}$ = ORP + 200 + (pH-7)58

Bionomics Laboratory, Inc.

4310 EAST ANDERSON ROAD P.O. BOX 8011 ORLANDO, FLORIDA 32812
(407) 851-2560 RICHARD ALT, PRESIDENT

August 30, 1988

FOR: City of Orlando
Bureau of Streets and Drainage
1010 S. Westmoreland
Orlando, FL 32805

ATTN: David Pearce

RE: Lake Monitoring Program, samples submitted by client 8/4/88
Lake Sue

LABORATORY REPORT

LAB I.D. NO.	883769	883770	883771	
MARKS	S1	S2	S3	
DATE RECEIVED	8/4/88	8/4/88	8/4/88	Avg.
pH, Lab	7.20	7.00	7.95	
Alkalinity, Total as CaCO3, mg/l	40	46	46	
Total Phosphorus as P, mg/l	0.086	0.077	0.068	.068
Ortho Phosphate as P, mg/l	< 0.005	0.006	< 0.005	
Total Nitrogen as N, mg/l	1.04	1.04	1.20	1.11
Ammonia Nitrogen as N, mg/l	0.015	< 0.02	0.26	
Nitrate Nitrogen as N, mg/l	< 0.05	< 0.05	< 0.05	
Nitrite Nitrogen as N, mg/l	< 0.005	< 0.005	< 0.005	
Total Kjeldahl Nitrogen as N, mg/l	1.04	1.04	1.20	
Total Suspended Solids, mg/l	3.0	6.0	5.5	
Volatile Suspended Solids, mg/l	3.0	6.0	5.5	
Total Dissolved Solids, mg/l	105	111	108	
Fecal Coliform per 100 ml	102	31	18	
Chlorophyll-a, mg/m3	22	26	13	21

SD = .94

$\frac{TN}{TP} = 16$ bal

TSI
Chla = 61
SD = 62
Nut = 59

TSI (FLA) = 61

Signed Richard Alt
Richard Alt, Chemist

Bionomics Laboratory, Inc.
4310 EAST ANDERSON ROAD P.O. BOX 8011 ORLANDO, FLORIDA 32812
(407) 851-2560 RICHARD ALT, PRESIDENT

August 30, 1988

FOR: City of Orlando
Bureau of Streets and Drainage
1010 S. Westmoreland
Orlando, FL 32805

ATTN: David Pearce

RE: Lake Monitoring Program, samples submitted by client 8/4/88
Lake Sue

LABORATORY REPORT

LAB I.D. NO.	883772	883773
MARKS	S4	S2 (Deep)
DATE RECEIVED	8/4/88	8/4/88
pH, Lab	7.90	6.90
Alkalinity, Total as CaCO3, mg/l	48	46
Total Phosphorus as P, mg/l	0.043	0.043
Ortho Phosphate as P, mg/l	0.006	< 0.005
Total Nitrogen as N, mg/l	1.17	1.38
Ammonia Nitrogen as N, mg/l	0.28	0.40
Nitrate Nitrogen as N, mg/l	< 0.05	< 0.05
Nitrite Nitrogen as N, mg/l	< 0.005	< 0.005
Total Kjeldahl Nitrogen as N, mg/l	1.17	1.38
Total Suspended Solids, mg/l	4.5	5.5
Volatile Suspended Solids, mg/l	4.5	5.5
Total Dissolved Solids, mg/l	109	112
Fecal Coliform per 100 ml	7	---
Chlorophyll-a, mg/m3	22	22

Signed Richard Alt
Richard Alt, Chemist

1015A

S-1 SD - .91 meters

7-7-A

D.	TEMP	PH	DO	COND	ORP
.1	30.4	7.23	5.4	176	101
.5	30.3	7.24	5.3	176	98
1.0	30.1	7.31	5.4	176	96
2.0	30.0	7.21	5.1	176	99
3.0	29.9	7.04	4.5	176	102
4.0	29.8	6.88	3.9	177	105
5.0	29.7	6.67	2.8	180	109
6.0[3]	28.9	6.06	.6	252	-138

1045

S-2 SD - .93 meters

8-8-G

D.	TEMP.	PH	DO	COND	ORP.
.1	30.6	8.12	7.1	188	70
.5	30.3	8.15	7.0	188	71
1.0	30.2	8.14	6.8	188	72
2.0	30.0	7.89	6.3	189	79
3.0	29.8	7.10	4.0	190	100
4.0	28.8	6.55	.6	200	-83
4.48	28.5	6.50	.5	217	-160

deep sample

3-1

S-3 SD .98 1100A

6-6-D

D	TEMP	PH	DO	COND	ORP
.1	30.9	8.14	7.0	187	61
.5	30.4	8.22	7.10	187	59
1.0	30.2	8.19	6.9	187	61
2.0	30.0	8.10	6.6	188	63
3.0	29.8	7.25	4.6	190	85
4.0	29.0	6.59	.7	201	-10
4.6B	28.6	6.49	.5	218	-145

S-4 SD - .95 meters

1-5-H 1120

D.	TEMP	PH	DO	COND.	ORP.
.1	31.1	8.07	6.6	188	54
.5	30.7	8.12	6.7	188	55
1.0	30.3	8.13	6.6	188	56
2.0	30.1	7.94	6.1	188	61
3.0	29.7	6.93	3.1	191	86
3.7B	29.2	6.62	.6	201	-45

Bionomics Laboratory, Inc.
4310 EAST ANDERSON ROAD P.O. BOX 8011 ORLANDO, FLORIDA 32812
(407) 851-2560 RICHARD ALT, PRESIDENT

November 29, 1988

FOR: City of Orlando
Bureau of Streets and Drainage
1010 S. Westmoreland
Orlando, FL 32805

DEC 1 1988
BUREAU OF
STREETS & DRAINAGE

ATTN: David Pearce

RE: Lake Monitoring Program, samples submitted by client 11/8/88
Lake Sue

LABORATORY REPORT

LAB I.D. NO.	885268	885269	885270	885271	
MARKS	S1	S2	S3	S4	
DATE RECEIVED	11/8/88	11/8/88	11/8/88	11/8/88	
pH, Lab	6.92	7.02	7.10	6.48	
Alkalinity, Total as $CaCO_3$, mg/l	44	44	43	36	
Total Phosphorus as P, mg/l	0.030	0.043	0.049	0.027	.037
Ortho Phosphate as P, mg/l	< 0.005	< 0.005	< 0.005	< 0.005	
Total Nitrogen as N, mg/l	0.75	0.70	0.73	0.79	.74
Ammonia Nitrogen as N, mg/l	0.06	0.11	0.10	0.10	
Nitrate Nitrogen as N, mg/l	< 0.05	< 0.05	< 0.05	< 0.05	
Nitrite Nitrogen as N, mg/l	0.010	0.006	0.007	< 0.005	
Total Kjeldahl Nitrogen as N, mg/l	0.74	0.69	0.72	0.79	
Total Suspended Solids, mg/l	5.0	6.0	6.0	5.0	
Volatile Suspended Solids, mg/l	4.0	4.0	4.0	3.0	
Total Dissolved Solids, mg/l	87	92	101	109	
Fecal Coliform per 100 ml	58	44	56	18(E)	23
Chlorophyll-a, mg/m_3	21	26	25	20	

SD = 1.16

(E) = Less than statistically valid number of colonies and/or greater than 200 colonies on plates counted

$\frac{TN}{TP}$ = 20 Bal

TSI
Chl a = 62
SD = 56
Nut = 49
TSI (FL) = 56

Signed Mark Kromis
Mark Kromis, Chemist

slight green small plankton algae

PHYSICAL - CHEMICAL PROFILES

Nice Day!

Location: Sue Date: 11-8-88 Condition: Sunny, Clear, warm Air Temp: 75°F

Station: S-1 Time: 11:45

Depth m	Temp °C	pH	DO mg/1	Cond. uS/cm	ORP mv	* ORP mv
.1	23.3	7.06	7.1	183	117	320
.5	23.2	7.1	6.7	185	117	323
1.0	22.6	6.98	6.3	184	119	318
2.0	22.1	6.83	5.1	183	123	313
3.0	22.0	6.74	4.7	183	124	309
4.0	22.0	6.74	4.7	183	123	308
5.0	21.9	6.71	4.6	183	123	306
5.9 B	21.9	6.69	2.3	192	117	299

Secchi Disk Depth: 1.25 m

Station: S-2 Time: 12:10

Depth m	Temp °C	pH	DO mg/1	Cond. uS/cm	ORP mv	* ORP mv
.1	23.2	7.15	7.5	184	110	319
.5	22.9	7.16	7.3	184	110	319
1.0	22.6	7.14	7.2	185	111	321
2.0	22.5	7.10	6.6	185	112	318
3.0	22.4	7.03	6.4	185	114	316
4.0	22.3	6.97	6.1	186	116	314
4.2 B	22.3	6.91	5.8	185	117	312

Secchi Disk Depth: 1.15 m

muck on ankor

*Corrected: $\overset{*}{ORP} = ORP + 200 + (pH-7)58$

PHYSICAL - CHEMICAL PROFILES

Location: Sue (Cont.) Date: 11/8/88 Condition: ______ Air Temp: ______

Station: 5-3 Time: 12:30

Depth m	Temp °C	pH	DO mg/1	Cond. uS/cm	ORP mv	* ORP mv
.1	23.5	733	7.8	185	108	327
.5	23.2	739	7.8	185	106	329
1.0	22.6	7.26	6.9	184	112	327
2.0	22.5	7.17	6.8	185	113	321
3.0	22.3	7.17	5.9	185	117	327
4.0	22.2	7.03	5.9	185	117	319
4.3 B	22.2	6.98	5.9	184	119	318

Secchi Disk Depth: 1.10 m

Station: 5-4 Time: 12:50

Depth m	Temp °C	pH	DO mg/1	Cond. uS/cm	ORP mv	* ORP mv
.1	23.8	7.48	8.0	184	106	334
.5	23.4	7.52	8.0	184	106	336
1.0	23.0	7.59	8.01	184	104	338
2.0	22.3	7.66	8.0	185	104	342
3.0	22.1	7.41	6.5	185	113	337
3.2 B	22.1	7.21	6.3	186	117	329

Secchi Disk Depth: 1.15 m

3.5 total

muck on ankor

*Corrected: $\overset{*}{ORP} = ORP + 200 + (pH-7)58$

Bionomics Laboratory, Inc.
4310 E. Anderson Road Orlando, Florida 32812 FDHRS Cert. No. 88008
(407) 851-2560 FAX (407) 856-0886

April 18, 1989

FOR: City of Orlando
Bureau of Streets and Drainage
1010 S. Westmoreland
Orlando, FL 32805

APR 26 1989
BUREAU OF
STREETS & DRAINAGE

ATTN: David Pearce

RE: Lake Monitoring Program, samples submitted by client 3/15/89
Lake Sue

LABORATORY REPORT

LAB I.D. NO.	891516	891517	891518	891519	
MARKS	S-1	S-2	S-3	S-4	
DATE RECEIVED	3/15/89	3/15/89	3/15/89	3/15/89	Avg
pH, Lab	7.90	8.45	8.35	8.45	
Alkalinity, Total as $CaCO_3$, mg/l	53	50	48	51	
Total Phosphorus as P, mg/l	0.029	0.016	0.019	0.022	.022
Ortho Phosphate as P, mg/l	< 0.005	< 0.005	< 0.005	< 0.005	
Total Nitrogen as N, mg/l	0.53	0.37	0.39	0.30	.40
Ammonia Nitrogen as N, mg/l	< 0.02	< 0.02	< 0.02	< 0.02	
Nitrate Nitrogen as N, mg/l	< 0.05	< 0.05	< 0.05	< 0.05	
Nitrite Nitrogen as N, mg/l	< 0.005	< 0.005	< 0.005	< 0.005	
Total Kjeldahl Nitrogen as N, mg/l	0.53	0.37	0.39	0.30	
Total Suspended Solids, mg/l	1.5	1.5	< 0.5	0.5	
Volatile Suspended Solids, mg/l	1.5	1.5	< 0.5	0.5	
Total Dissolved Solids, mg/l	103	105	101	103	
Fecal Coliform per 100 ml	16(E)	6(E)	8(E)	6(E)	
Chlorophyll-a, mg/m_3	18	6.6	8.5	6.4	10

SD = 2.50 m

(E) = Less than statistically valid number of colonies and/or greater than 200 colonies on plates counted

$\frac{TN}{TP} = 18$ Bal

TSI
Chl a = 50
SD = 33
Nut = 38

TSI (FLA) = 40

Signed Mark Kromis
Mark Kromis, Chemist

PHYSICAL - CHEMICAL PROFILES

Location: Sue

Date: 3/15/89 Condition: Sunny, Clear, lt breeze Air Temp: ~75°F

Station: S-1 Time: 1100

Depth m	Temp °C	pH	DO mg/1	Cond. uS/cm	ORP mv	* ORP mv
.1	20.7	7.63	9.4	191	87	324
.5	19.9	7.71	9.4	191	84	325
1.0	19.7	7.66	9.6	191	86	324
2.0	18.3	8.14	10.6	189	72	338
3.0	17.3	7.73	9.8	190	85	327
4.0	16.6	7.16	7.6	190	106	315
5.0	16.4	6.78	5.9	192	116	303
5.5	16.4	6.68	5.6	192	113	294

Secchi Disk Depth: 2.25 m

Station: S-2 Time: 1115

Depth m	Temp °C	pH	DO mg/1	Cond. uS/cm	ORP mv	* ORP mv
.1	20.2	7.82	10.0	188	78	326
.5	20.0	7.85	9.6	187	77	326
1.0	19.6	7.63	9.5	189	84	321
2.0	19.1	7.91	9.9	188	73	326
3.0	18.1	7.91	9.9	188	72	325
4.0	17.7	6.97	6.8	190	103	301
4.2	17.7	6.89	6.6	189	105	299

Secchi Disk Depth: 2.75

*Corrected: $\overset{*}{\text{ORP}}$ = ORP + 200 + (pH-7)58

PHYSICAL - CHEMICAL PROFILES

Location: Sue (cont.) Date: 3/15/89 Condition: breezy Air Temp: ______

Station: S-3 Time: 1130

Depth m	Temp °C	pH	DO mg/1	Cond. uS/cm	ORP mv	* ORP mv
.1	20.0	7.90	9.9	187	77	329
.5	20.0	7.92	9.7	187	74	327
1.0	19.9	7.94	9.8	188	72	327
2.0	19.1	8.02	10.0	186	70	329
3.0	18.5	7.87	9.8	187	73	323
4.0	17.7	7.25	7.8	188	98	313
4.4	17.7	6.95	7.4	188	99	296

Secchi Disk Depth: 2.50
4.5

Station: S-4 Time: 1200

Depth m	Temp °C	pH	DO mg/1	Cond. uS/cm	ORP mv	* ORP mv
.1	20.3	7.89	9.7	186	77	329
.5	20.2	7.93	9.8	186	74	328
1.0	20.2	7.94	9.8	186	73	328
2.0	20.1	7.98	9.9	187	70	327
3.0	18.5	7.51	8.3	187	93	323
3.2	18.3	7.16	8.2	188	98	307

Secchi Disk Depth: 2.50 M
3.5

*Corrected: $\overset{*}{ORP} = ORP + 200 + (pH-7)58$

Bionomics Laboratory, Inc.
4310 EAST ANDERSON ROAD P.O. BOX 8011 ORLANDO, FLORIDA 32812
(407) 851-2560 RICHARD ALT, PRESIDENT

June 1, 1988

Note: 1"-2" of rain day before

FOR: City of Orlando
Bureau of Streets and Drainage
1010 S. Westmoreland
Orlando, FL 32805

ATTN: David Pearce

RE: Lake Monitoring Program, samples submitted by client 4/20/88
Lake Rowena

LABORATORY REPORT

LAB I.D. NO.	881805	881806	
MARKS	R-1	R-2	
DATE RECEIVED	4/20/88	4/20/88	Avg.
pH	7.30	7.50	
Alkalinity, Total as CaCO3, mg/l	60	60	
Total Phosphorus as P, mg/l	0.062	0.029	.043
Ortho Phosphate as P, mg/l	0.009	0.018	
Total Nitrogen as N, mg/l	0.76	0.68	.72
Ammonia Nitrogen as N, mg/l	0.089	0.036	
Nitrate Nitrogen as N, mg/l	0.06	0.08	
Nitrite Nitrogen as N, mg/l	0.005*	0.005*	
Total Kjeldahl Nitrogen as N, mg/l	0.70	0.60	
Total Suspended Solids, mg/l	0.50*	2.0	
Volatile Suspended Solids, mg/l	0.5*	0.5*	
Total Dissolved Solids, mg/l	127	127	
Fecal Coliform per 100 ml	145	54	
Chlorophyll-a, mg/m3	12.5	13.4	13.0
Total Coliform per 100 ml	3,300	4,500	
		S.D.	1.77

* Less than

$\frac{TN}{TP} = 17$ Nut. Balanced

TSI
Chla = 54
SD = 43
Nut = 51
TSI (FLA) = 49

Signed Richard Alt
Richard Alt, Chemist

PHYSICAL - CHEMICAL PROFILES

Location: Lk Ravena Date: 4-20-[illegible] Condition: [illegible] Air Temp: 75

Station: SE R-1 Time: 10:30

Depth m	Temp °C	pH	DO mg/1	Cond. uS/cm	ORP mv	* ORP mv
[illegible]	23.0	8.[illegible]	8.4	210	[illegible]	373
0.5	23.0	[illegible]	[illegible]	[illegible]	[illegible]	372
[illegible]	[illegible]	[illegible]	[illegible]			371
[illegible]			[illegible]	[illegible]	[illegible]	367
3.0	[illegible]		7.2	211	122	357
[illegible] B		[illegible]	[illegible]			332
[illegible]						323

Secchi Disk Depth: 1.81 m

Station: R-2 Time: 10:51

Depth m	Temp °C	pH	DO mg/1	Cond. uS/cm	ORP mv	* ORP mv
0.1	23.2	8.3	8.6	209	83	358
0.5	23.2	8.3	8.4	211	83	358
1.0	23.1	8.2	[illegible]	211	85	355
2.0	22.9	[illegible]	8.0	[illegible]	[illegible]	350
3.0	22.8	8.0	7.9	212	92	350
4.0	21.5	7.1	2.3	213	127	333
4.5 (B)	21.4	6.9	1.6	215	128	322

Secchi Disk Depth: 1.73 m

*Corrected: $ORP^* = ORP + 200 + (pH-7)58$

Bionomics Laboratory, Inc.
4310 E. Anderson Road Orlando, Florida 32812 FDHRS Cert. No. 88008
(407) 851-2560 FAX (407) 856-0886

April 17, 1989

FOR: City of Orlando
Bureau of Streets and Drainage
1010 S. Westmoreland
Orlando, FL 32805

ATTN: David Pearce

RE: Lake Monitoring Program, samples submitted by client 3/15/89
Lake Rowena

LABORATORY REPORT

LAB I.D. NO.	891514	891515	
MARKS	R-1	R-2	
DATE RECEIVED	3/15/89	3/15/89	Avg.
pH, Lab	8.10	8.40	
Alkalinity, Total as $CaCO_3$, mg/l	60	58	
Total Phosphorus as P, mg/l	0.032	0.035	.034
Ortho Phosphate as P, mg/l	< 0.005	< 0.005	
Total Nitrogen as N, mg/l	0.67	0.52	.60
Ammonia Nitrogen as N, mg/l	0.03	< 0.02	
Nitrate Nitrogen as N, mg/l	0.05	< 0.05	
Nitrite Nitrogen as N, mg/l	< 0.005	< 0.005	
Total Kjeldahl Nitrogen as N, mg/l	0.62	0.52	
Total Suspended Solids, mg/l	2.2	1.5	
Volatile Suspended Solids, mg/l	2.2	1.5	
Total Dissolved Solids, mg/l	109	112	
Fecal Coliform per 100 ml	34(E)	< 2	
Chlorophyll-a, mg/m_3	16	18	17

SD = 1.28

(E) = Less than statistically valid number of colonies and/or greater than 200 colonies on plates counted

$\frac{TN}{TP} = 18$ Bal

TSI
Chl a = 58
SD = 53
Nut = 47
TSI (FLA) = 52

Signed Mark Kromis
Mark Kromis, Chemist

PHYSICAL - CHEMICAL PROFILES

Location: Rowena   Date: 3/15/89   Condition: very lt breeze Clear, Sunny   Air Temp: ~ 75°F

Station: R-1   Time: 1010

Depth m	Temp °C	pH	DO mg/1	Cond. uS/cm	ORP mv	* ORP mv
.1	21.0	6.68	8.8	193	126	304
.5	19.9	7.68	9.9	194	95	334
1.0	19.8	7.82	9.9	194	93	341
2.0	19.0	7.85	10.0	195	91	340
3.0	17.7	7.02	6.6	194	127	328
3.9°	17.5	6.64	5.2	195	134	313

Secchi Disk Depth: 1.30 m

Station: R-2   Time: 1035

Depth m	Temp °C	pH	DO mg/1	Cond. uS/cm	ORP mv	* ORP mv
.1	20.4	7.91	9.8	192	83	336
.5	20.2	7.97	9.9	193	81	337
1.0	19.8	7.95	10.0	192	80	335
2.0	18.9	7.99	10.1	193	79	336
3.0	17.9	7.41	9.2	192	96	320
4.0	17.4	6.94	4.4	193	118	316

Secchi Disk Depth: 1.25 m

*Corrected: $\overset{*}{ORP} = ORP + 200 + (pH-7)58$

PHYSICAL - CHEMICAL PROFILES

Location: Rowena   Date: 3/15/89 Condition: very lt breeze Clear, Sunny   Air Temp: ~75°F

Station: R-1   Time: 1010

Depth m	Temp °C	pH	DO mg/1	Cond. uS/cm	ORP mv	* ORP mv
.1	21.0	6.68	8.8	193	126	304
.5	19.9	7.68	9.9	194	95	334
1.0	19.8	7.82	9.9	194	93	341
2.0	19.0	7.85	10.0	195	91	340
3.0	17.7	7.02	6.6	194	127	328
3.9°	17.5	6.64	5.2	195	134	313

Secchi Disk Depth: 1.30 m

Station: R-2   Time: 1035

Depth m	Temp °C	pH	DO mg/1	Cond. uS/cm	ORP mv	* ORP mv
.1	20.4	7.91	9.8	192	83	336
.5	20.2	7.97	9.9	193	81	337
1.0	19.8	7.95	10.0	192	80	335
2.0	18.9	7.99	10.1	193	79	336
3.0	17.9	7.41	9.2	192	96	320
4.0	17.4	6.94	4.4	193	118	316

Secchi Disk Depth: 1.25 m

*Corrected: $\overset{*}{\mathrm{ORP}}$ = ORP + 200 + (pH-7)58

PHYSICAL - CHEMICAL PROFILES

Location: Rowena   Date: 3/15/89 Condition: very lt breeze Clear, Sunny   Air Temp: ~75°F

Station: R-1						Time: 1010
Depth m	Temp °C	pH	DO mg/1	Cond. uS/cm	ORP mv	* ORP mv
.1	21.0	6.68	8.8	193	126	304
.5	19.9	7.68	9.9	194	95	334
1.0	19.8	7.82	9.9	194	93	341
2.0	19.0	7.85	10.0	195	91	340
3.0	17.7	7.02	6.6	194	127	328
3.9°	17.5	6.64	5.2	195	134	313

Secchi Disk Depth: 1.30 m

Station: R-2						Time: 1035
Depth m	Temp °C	pH	DO mg/1	Cond. uS/cm	ORP mv	* ORP mv
.1	20.4	7.91	9.8	192	83	336
.5	20.2	7.97	9.9	193	81	337
1.0	19.8	7.95	10.0	192	80	335
2.0	18.9	7.99	10.1	193	79	336
3.0	17.9	7.41	9.2	192	96	320
4.0	17.4	6.94	4.4	193	118	316

Secchi Disk Depth: 1.25 m

*Corrected: $\overset{*}{\mathrm{ORP}} = \mathrm{ORP} + 200 + (\mathrm{pH}-7)58$

Very small planktonic algae

PHYSICAL - CHEMICAL PROFILES

Nice Day!

Location: Rowena Date: 11-8-88 Condition: Sunny, clear, warm Air Temp: 75°F

Station: R-1 Time: 11:10

Depth m	Temp °C	pH	DO mg/1	Cond. uS/cm	ORP mv	* ORP mv
.1	22.9	6.59	7.9	180	193	369
.5	22.9	6.78	7.6	181	184	371
1.0	22.8	6.82	7.2	181	181	371
2.0	22.4	6.79	6.6	181	180	368
2.4 B	22.4	6.76	6.4	181	180	366

Secchi Disk Depth: 1.06 m

Station: R-2 Time: 11:30

Depth m	Temp °C	pH	DO mg/1	Cond. uS/cm	ORP mv	* ORP mv
.1	23.3	7.03	7.7	180	143	345
.5	22.9	7.05	7.3	180	141	344
1.0	22.6	7.00	6.2	180	142	342
2.0	22.4	6.94	6.5	180	143	340
3.0	22.4	6.79	5.9	179	143	331
4.0 B	22.3	6.74	5.5	181	142	327

Secchi Disk Depth: 1.06 m

*Corrected: $\overset{*}{ORP} = ORP + 200 + (pH-7)58$

Bionomics Laboratory, Inc.

4310 EAST ANDERSON ROAD P.O. BOX 8011 ORLANDO, FLORIDA 32812
(407) 851-2560 RICHARD ALT, PRESIDENT

November 29, 1988

FOR: City of Orlando
Bureau of Streets and Drainage
1010 S. Westmoreland
Orlando, FL 32805

DEC 1 1988
BUREAU OF
STREETS & DRAINAGE

ATTN: David Pearce

RE: Lake Monitoring Program, samples submitted by client 11/8/88
Lake Rowena

LABORATORY REPORT

LAB I.D. NO. MARKS DATE RECEIVED	885266 R1 11/8/88	885267 R2 11/8/88	Avg.
pH, Lab	5.90	6.90	
Alkalinity, Total as $CaCO_3$, mg/l	22	45	
Total Phosphorus as P, mg/l	0.038	0.055	.047
Ortho Phosphate as P, mg/l	< 0.005	< 0.005	
Total Nitrogen as N, mg/l	0.85	0.87	.86
Ammonia Nitrogen as N, mg/l	0.11	0.06	
Nitrate Nitrogen as N, mg/l	< 0.05	< 0.05	
Nitrite Nitrogen as N, mg/l	< 0.005	< 0.005	
Total Kjeldahl Nitrogen as N, mg/l	0.85	0.82	
Total Suspended Solids, mg/l	5.0	3.5	
Volatile Suspended Solids, mg/l	4.2	2.5	
Total Dissolved Solids, mg/l	96	92	
Fecal Coliform per 100 ml	144(E)	340	
Chlorophyll-a, mg/m_3	28	31	30

SD = 1.06

(E) = Less than statistically valid number of colonies and/or greater than 200 colonies on plates counted

$\frac{TN}{TP} = 18$ Bal

TSI
Chla = 66
SD = 58
Nut = 53
TSI(FL) = 59

Signed Mark Kromis
Mark Kromis, Chemist

Bionomics Laboratory, Inc.
4310 EAST ANDERSON ROAD P.O. BOX 8011 ORLANDO, FLORIDA 32812
(407) 851-2560 RICHARD ALT, PRESIDENT

August 30, 1988

FOR: City of Orlando
Bureau of Streets and Drainage
1010 S. Westmoreland
Orlando, FL 32805

ATTN: David Pearce

RE: Lake Monitoring Program, samples submitted by client 8/4/88
Lake Rowena

LABORATORY REPORT

LAB I.D. NO.	883767	883768	
MARKS	R1	R2	
DATE RECEIVED	8/4/88	8/4/88	Avg.
pH, Lab	7.45	7.65	
Alkalinity, Total as $CaCO_3$, mg/l	48	46	
Total Phosphorus as P, mg/l	0.064	0.060	.062
Ortho Phosphate as P, mg/l	< 0.005	< 0.005	
Total Nitrogen as N, mg/l	1.02	1.00	1.01
Ammonia Nitrogen as N, mg/l	< 0.02	0.040	
Nitrate Nitrogen as N, mg/l	0.061	0.056	
Nitrite Nitrogen as N, mg/l	< 0.005	< 0.005	
Total Kjeldahl Nitrogen as N, mg/l	0.96	0.94	
Total Suspended Solids, mg/l	4.8	4.5	
Volatile Suspended Solids, mg/l	4.0	4.5	
Total Dissolved Solids, mg/l	104	102	
Fecal Coliform per 100 ml	118	102	
Chlorophyll-a, mg/m3	18	38	28

SD = 1.01

$\frac{TN}{TP} = 16$

TSI
Chla = 65
SD = 60
Nut = 57
TSI (FLA) = 61

Signed Richard Alt
Richard Alt, Chemist

905A

R-1 SD 1.02 meters
LAB 2-4-~~A~~ C

D.	TEMP.	PH	D.O.	COND.	ORP.	Corrected ORP
.1	29.5	7.55	6.3	174	105	339
.5	29.6	7.60	6.2	173	105	339
1.0	29.6	7.53	6.0	173	107	338
2.0	29.6	7.35	5.7	173	112	332
3.0	29.5	7.13	5.5	173	117	325
3.9 B	28.1	6.35	0.8	218	-155	7

945A

R-2 SD- .99 meters

5-3-B

D.	TEMP.	PH	DO	COND.	ORP	Corrected ORP
.1	30.0	7.99	6.8	171	78	335
.5	30.0	8.00	6.8	172	78	336
1.0	29.9	8.01	6.7	172	79	338
2.0	29.8	7.84	6.2	172	83	332
3.0	29.5	6.77	1.9	175	107	294
4.0	28.4	6.39	.5	198	-108	57
4.4[B]	27.9	6.32	.4	223	-162	-1

ORANGE COUNTY POLLUTION CONTROL DEPARTMENT
Microbiology Summary
[NOT FOR PUBLICATION]

LOCATION Sue

STATION HB36

SAMPLE NUMBER	FECAL INDICATORS 100ml T.C.	F.C.	F.S.	STAPH AURUS 100ml	P.AERUGINOSA 100ml	A.HYDROPHILA 100ml	STD. AEROB PER ml	P.C.35°C ANAER PER ml	H2S PROD. PER ml	ISOL PO4 PER ml	TOTAL FUNGI	OTHER PARAMETERS	REMARKS	REV
12-2181 HB36	<20	<20	<20	140	48	710	1780							
12-2181 HB36	<20	<20	<20	120	45	700	1140						Duplicate	
12-2181 HB36	<20	<20	<20	<100	<10	680	<300							
3-282 HB36	<20	<20	<20			440	$<3\times10^2$							
3-282 HB36	<20	<20	<20			440	$<3\times10^2$							
3-282 HB36	<20	<20	140			460	5.3×10^2							
6-182 HB36	44	44	38	<100	<20	100	<300							
6-182 HB36	46	24	30	<100	<20	200	6.6×10^2							
8-1182 HB36	54	26	<20	-	<20	300								
8-3182 HB36	<20	<20	<20			160	<300							
8-3182 HB36	<20	<20	<20			130	4.9×10^2						duplicate	
8-3182 HB36	<20	<20	<20			150	7.7×10^2							
11-2382 HB36														
11-2382 HB36	150	32	54		<20		6×10^3							[illegible]
9-386 HB36	22	<20	>160		<10	110	<300							[illegible]
17449 2-188	>160	>120	>160		<10	-800	7.0×10^2							[illegible]
18323 8-188	280	130	30		32	440	5.6×10^2							[illegible]
dup	210	150	18		21	360	4.7×10^2							[illegible]
18717 10-188	32E	2E	<1		<10	18E	$>3\times10^3$							[illegible]
19135 2-189	26E	18E	2E		2E	>800	7.6×10^2							[illegible]
dup 2-189	24E	2E	<2		1E	>800	4.8×10^2							[illegible]

45-46 (9/79)

ORANGE COUNTY POLLUTION CONTROL DEPARTMENT
PLANKTON SUMMARY
• [*NOT FOR PUBLICATION*] •

LOCATION Sue — STATION HB36

SAMPLE NUMBER	DEPTH	CHLOROPHYLL A B/A	CHLOROPHYLL A FUNCT.	CHLOROPHYLL A N-FUNCT.	CHLOROPHYLL A	CHLOROPHYLL B	CHLOROPHYLL C	NON AST CAROT-ENOIDS	CHLOR. A SP-	TOTAL LIVE ALGAE	MIN. NO. SPECIES	CYANOPHYTA COCC.	CYANOPHYTA FIL.	CHLOROPHYTA COCC.	CHLOROPHYTA FIL.	CHLOROPHYTA FLAG.	CHLOROPHYTA EUG.	CHRYSOPHYTA CENT.	CHRYSOPHYTA PENN.	OTHER
H12-2181 HB36	surf	1.60	12.04	1.88	13.17	1.34	2.26	6.42	2.04	1920	12	120	60	840		120			420	360
H12-2181 HB36	surf	1.52	9.83	3.24	11.59	2.43	4.61	7.13	1.62											
H12-2181 HB36	4.5	1.45	11.06	6.10	14.49	2.87	5.48	8.78	1.65											
H3-282 HB36	surf	1.48	8.10	3.63	10.09	2.17	4.22	5.13	1.96											
H3-282 HB36	surf	1.52	8.93	3.17	10.67	2.08	5.41	6.29	1.69											
H3-282 HB36	4.2	1.52	9.51	3.19	11.22	2.54	4.63	6.60	1.70											
H6-182 HB36	surf	1.48	26.46	12.52	33.80	3.89	8.02	22.20	1.52											
H6-182 HB36	4.0	1.63	27.22	3.26	28.99	4.31	8.00	18.79	1.53											
—																				
H8-3182 HB36	surf	1.71	24.59	0.00	24.34	2.35	3.74	13.62	1.79	2100	7	240		1140		240		60	360	60
H8-3182 HB36	surf	1.70	24.12	0.00	24.03	3.59	0.09	13.98	1.72											
H8-3182 HB36	4.0	1.65	27.64	1.91	28.66	4.40	1.38	15.04	1.91											
H11-2382 HB36	surf	1.87	34.32	0.00	31.00	0.00	0.00	17.35	1.79	29120	12	420	23580	1640			120		2640	720
H11-2382 HB36	4.0	1.82	38.90	0.00	36.21	0.00	1.41	17.82	2.03											
16488 6-1087	surf	1.7	31.6	0.0	32.0	0.0	0.0 ~~34.3~~	31.3 ~~7.0~~	1.0	185700	10	480	182580	2040					480	120
17449 2-188	surf	>1.7	4.5	0.0	3.9	0.6	1.0	1.6	2.5	180	2			60					120	
18323 5-1588	surf	161.3	23.5	3.5	25.4	5.1	0.0	13.8	1.9	10860	12	360	880	1320					120	120
dup	surf	157.3	22.5	4.0	24.8	4.3	0.0	13.4	1.8											
18717 10-1888	surf	161.9	31.3	4.1	33.9	3.2	0.0	19.7	1.7	42420	10	600	39300	720	120			120	1560	
19135-2789	surf	154.6	7.7	2.2	8.9	1.7	4.4	4.9	1.8	2880	6	360		300				1560		60
dup 2-189	surf	154.8	7.3	2.0	8.7	0.0	1.4	4.7	1.9											

45-46 (9/79)

ORANGE COUNTY POLLUTION CONTROL DEPARTMENT
Microbiology Summary
[NOT FOR PUBLICATION]

LOCATION SUE

STATION HB36

SAMPLE NUMBER	FECAL INDICATORS 100ml T.C.	F.C.	F.S.	STAPH AURUS 100ml	P.AERUGINOSA 100ml	A.HYDROPHILA 100ml	STD. AEROB PER ml	P.C.35°C ANAER PER ml	H2S PROD. PER ml	ISOL PO4 PER ml	TOTAL FUNGI	OTHER PARAMETERS	REMARKS	REF
8-172 HB36	700	4	20											
8-1372 HB36	240	O.G.	15				1.92×10^4							
11-1174 HB36	<50	<10	35				3.5×10^2							
11-1174 HB36	<50	<10	37				4.7×10^3							
9-776 HB36	O.G.	30	<20				$<3 \times 10^2$							
8-1777 HB36	130	<20	20	400	<20	600							request	
7-1078 HB36	170	<20	<20		20	150								
6-1880 HB36	<106	<20	<20		<20									
6-2480 HB36	<20	<10	<10	180	<10									
3-1781 HB36S	<20	<20	<20	<100	<10	640	3.1×10^2							
3-1781 HB36B	<20	<20	<20	>800	<10	540	7.7×10^2							
5-681 HB36	<20	<20	<10	<100	<10	>800							request	
6-1681 HB36S	<20	<20	<20		<10	<100	$<3 \times 10^2$							
6-1681 HB36S	<20	<20	<20		<10	<100	$<3 \times 10^2$						Quality control	
6-1681 HB36B	<20	<20	<20		50	400	6.5×10^2							
9-2281 HB36 S	22	20	Bad media	550	<10	130	<300							
9-2281 HB36 B	42	<20	"	230	<16	130	700							
9-2281 HB36 S	28	<20	Bad media	620	<10	540	<300						Duplicate	

45-46 (9/79)

Sue

ORANGE COUNTY POLLUTION CONTROL DEPARTMENT
PLANKTON SUMMARY
• [NOT FOR PUBLICATION] •

HB 36

SAMPLE NUMBER	DEPTH	CHLOROPHYLL A			CHLOROPHYLL			NON AST CAROT-ENOIDS	CHLOR. A SP-	TOTAL LIVE ALGAE	MIN. NO. SPECIES	CYANOPHYTA		CHLOROPHYTA				CHRYSOPHYTA		OTHER	P.G.
		B/A	FUNCT.	N-FUNCT.	A	B	C					COCC.	FIL.	COCC.	FIL.	FLAG.	EUG.	CENT.	PENN.		
H11-268 HB36	surf																				
H4-2870 HB36	surf		8.56	0.00						Qual.	9			*						*	
H11-2370 HB36	surf	1.90	12.62	0.00						7514	23	1430	205	4820		239		34	718	68	
H6-2171 HB36	surf	2.24	16.24	0.00						Qual.	5		*	*						*	
H11-2271 HB36	surf	1.60	11.59	0.45						Qual.	3		*	*							
H3-2372 HB36	surf	1.80	16.04	0.00	15.07	2.17	0.00			13889	25	96	11742	1121			71	167	167	525	
H3-2372 HB36	comp.	21.88	20.05	0.00	17.76	4.71	2.10			16563	21	58	146	15718			175	29	175	262	
H7-3172 HB36	surf	1.60	32.60	5.79	41.36	2.58	16.23			59621	15	60	55734	1074		60	119	1621	953		
—																					
H12-472 HB36	0-18'	1.43	15.04	9.52	21.01	0.91	5.43			2736	21	828	850	897		23		69	460	23	
H8-1374 HB36		1.71	44.91	0.00	45.90	0.00	0.00	50.40		7680	5	120	6660	600	180				120		
H11-1174 HB36	surf	1.89	31.27	0.00	28.09	0.00	0.00	21.60		29580	4	60	20880	8100		540					
H11-1174 HB36	0-10'	1.76	27.26	0.00	27.09	0.00	0.01	13.20		39180	5	600	31440	4260		1560			1320		
—																					
—																					
—																					
—																					
—																					
H3-1781 HB36	surf	1.43	9.62	5.70	12.89	2.60	3.23	7.88	1.63	3540	17		120	2040	60	360		60	450	420	12
H3-1781 HB36	4.0	1.47	10.52	5.05	13.47	2.16	2.80	8.64	1.55												
H6-1681 HB36	surf	1.78	28.73	0.00	26.79	5.45	6.76	32.70	0.81	236640	8	360	235800	300		60			60	60	6
H6-1681 HB36	ac surf	1.83	27.79	0.00	25.21	3.54	1.30	32.76	0.76												
H6-1681 HB36	4.0	1.62	36.75	4.41	38.98	9.47	1.02	36.90	1.05												
H9-2181 HB36	surf	1.62	27.89	3.51	30.16	2.67	1.25	17.05	1.76												
H9-2181 HB36	surf	1.60	28.35	4.23	31.16	1.71	1.65	17.35	1.79												
H9-2181 HB36	4.5	1.69	31.11	0.34	31.53	2.71	2.81	17.46	1.80												

45-46 (9/79)

ORANGE COUNTY POLLUTION CONTROL DEPARTMENT
LAKE MACROINVERTEBRATE SUMMARY
* (NOT FOR PUBLICATION) *

LOCATION Lake Sue

STATION HB-36

	SAMPLE NUMBER	SAMPLE DEPTH	pH	Sp. COND.	TEMP. (BOT.)	D.O. (BOT.)	Secchi disk	SUBSTRATE	TOTAL COUNT /m²	MIN NO SPECIES	D	$\bar{d}$	R	Secchi disk				
RK	K-11/2/[illegible]-1	7'					Unk	Sand Unk										
RK	" 2	15'					Unk	Mud Unk										
RK	" 3	20'					Unk	Mud Unk										
RK	" 4	7'					Unk	Sand Unk										
RK	" 5	littoral					Unk	Littoral Unk										
RK	K-3/23/77-A	16'					5'	mud South - MR	1474	3				3				
RK	" B	14'					5'	mud East - MR	2794	3				3				
RK	" C	15					5'	mud, det West - MR	1870	4				4				

45-43

ORANGE COUNTY POLLUTION CONTROL DEPARTMENT
LAKE MACROINVERTEBRATE SUMMARY
★ (NOT FOR PUBLICATION) ★

LOCATION Lake Sue

STATION HB-36

SAMPLE NUMBER	INDIVIDUALS								PERCENT								REMARKS
	OLIGO.	CULIC.	CHIRO.	TRICH.	EPHEM.	AMPH.	OTHERS		OLIGO.	CULIC.	CHIRO.	TRICH.	EPHEM.	AMPH.	OTHERS		
K-11-2-68-1																	
" 2																	
" 3																	
4																	
5																	
K-3/23/72-A	220	1100	154	0	0	0	0		15	75	10	0	0	0	0		Clear, sunny —
" B	242	2376	176	0	0	0	0		9	85	6	0	0	0	0		" —
" C	264	770	836	0	0	0	0		14	41	45	0	0	0	0		" —

45-43

ORANGE COUNTY ENVIRONMENTAL PROTECTION DEPARTMENT

PHYSICAL and CHEMICAL DATA

NOT FOR PUBLICATION

LOCATION Lake Sue

CODE HB-36

Sample No.	Date	Time	Temp °C	Depth m	Odor	Color	Secchi Disk m	Cond. µmho	D.O. mg/L.	B.O.D. mg/L	C.O.D. mg/L	pH	Total as mg/L $CaCO_3$ Alk.	Total as mg/L $CaCO_3$ Acidity	PHOSPHORUS mg/L Ortho	PHOSPHORUS mg/L Total Filt.	PHOSPHORUS mg/L Total Unfilt.	NITROGEN mg/L NO_3	NITROGEN mg/L NO_2	NITROGEN mg/L NH_3	NITROGEN mg/L Organic	NITROGEN mg/L TKN	NITROGEN mg/L Total	Cl mg/L	Total Cl Res mg/L	SO mg/l
16733	7/29/87		32°	surf				160				8.1	42.1	4.3	<.02	<0.02	0.033	<.02	<.01	<.04	0.449	0.449	0.449			
	1987							160				8.1	42.1	4.3	<.02	<.02	0.033	<.02	<.01	<.04	0.449	0.449	0.449			
17449	2/1/88	8:30	16.4°	surf	none	clear	2.4	290	9.3	1.9		6.5	52.6	—	* —	<0.02	0.050	1.848	0.010	<0.04	0.322	0.322	2.170		*SEE FOLDER	
18324	8/15/88	8:30	27.4°	surf	none	grn.	—	145	6.0	3.1		7.0	53.2	—	<0.02	0.028	0.030	0.030	<0.01	0.081	0.106	0.187	0.217			
18717	10/18/88	10:20	23.5°	"	"	"	—	210	8.4	3.6		7.8	56.7	—	0.001	0.012	0.032	0.018	<0.01	0.034	0.289	0.323	0.341			
	1988							215	7.9	2.9		7.1	54.2	—	<0.011	<0.02	0.037	0.632	<0.01	<0.052	0.239	0.277	0.909			
19135	2/1/89	8:07	20.7°	surf	none	green	1.9	210	8.9	2.1		7.3	50.3	—	<.001	0.008	0.028	0.011	<0.01	<0.01	0.161	0.161	0.172			

ORANGE COUNTY ENVIRONMENTAL PROTECTION DEPARTMENT
PHYSICAL and CHEMICAL DATA
NOT FOR PUBLICATION

LOCATION: Lake Sue

CODE: HB-36

Sample No.	Date	Turb. N.T.U.	SOLIDS mg/L Total	Suspended Fixed	Suspended Vol.	Na	Ca	Mg	K	Fe	Cu	Pb	Zn	Cd	Al	Ni	Mn	Cr	Hg	hardness					Rec. by
16733	7/29/87	2.4	143.																						[illegible]
	1987	2.4	143.																						[illegible]
17449	2/1/88	2.8	160.	7.5		15.87	17.26	3.60	3.52	0.086	0.029	0.004	—	0.006	0.20	0.071	0.021	0.002		57.92					[illegible]
18324	8/15/88	2.6	100.	5.0		7.71	11.52	3.81	2.06	0.035	0.037	—	0.011	<0.001	0.47	0.018	0.023	0.033		44.46					[illegible]
18717	10/18/88	2.6	111.5	5.5		7.83	18.54	2.97	1.55	<0.001	0.015	<0.01	0.006	0.006	0.05	0.022	0.015	0.008		58.53					[illegible]
	1988	2.7	123.8	6.0																					[illegible]
19135	2/1/89	1.9	109.0	1.0																					[illegible]

45-47 (12/86)

ORANGE COUNTY POLLUTION CONTROL DEPARTMENT
PHYSICAL AND CHEMICAL DATA
* (NOT FOR PUBLICATION) *

LOCATION Lake Sue STATION HB-36

Sample No.	Date	Time	Temp. oC	Depth	Color	D.O. ~~Flow mgd~~ mg/L	BOD mg/L	COD mg/L	Hard. mg/L CaCO3	pH	Total, as mg/L CaCO3 Alk.	Acid.	Phosphorous mg/L Total	Ortho	Poly	Nitrogen mg/L NO_3	NO_2	NH_3	Org.	Total	SO_4	TKN	
1770	10/4/72	9:00	17.5	5-19	GRN	7.0	2.3		82.0	7.2	73	1	.02	0	.02	c.23 ~~.02~~	.002	0	.38	.61 ~~.90~~			
5-1374	HB36	8:20	28.0	5-16.5	Lt Green	5.9	5.5		71.3	6.9	58	2	0.023	0.005	0.018	0.06	0.002	0	1.02	1.06			
11-1174	HB-36(s)	11:10	23	Surf	"	6.1	1.0			7.5	62	2	0.018	0.004	0.014	0	0	0	0.71	0.71			
11-1174	HB-36(5-10)	11:15	22.5	5-10	"	—	—			7.5	62	2	0.022	0.002	0.020	0.25	0	0	0.71	0.96			
													filt		unfilt								
6453	3-17-81	0925	18.0	Surf	muddy Green	8.0	2.95			7.5	66		0.03		0.06	0.06		0.29	1.01	1.4			
6454	3-17-81	"	18.0	4.0		8.2	3.4			7.7	68		0.03		0.07	0.09		0.25	1.25	1.6			
6833	6-16-81	0800	29.0	surf	brown	9.5	4.0			9.2	41		0.01		0.04	0.02		0.08	1.52	1.62			
6834	6-16-81	0800	28.0	4.0		3.0	8.5			7.6	47		0.01		0.05	0.01		0.14	1.46	1.61			
7239	9/22/81	0830	27.0	surf	brgrn	7.2	2.85			7.4	55		—		0.008	<0.04		0.12	1.1	1.2			Jim
7240	9/22/81	0830	27.0	4.5		5.2	6.00			7.4	59		—		<0.008	<0.04		0.08	1.2	1.3			Jim
7624	12/21/81	0845	12.0	4.5	green	8.4	—			—	—		0.029		0.055	0.11		0.28	0.92	1.3			Jim
7625	12/21/81	0845	12.0	surf		8.6	—			—	—		0.013		0.054	0.08		0.20	0.90	1.2			Jim
7785	3/2/82	0815	18.0	surf	gray	8.6	2.6			7.0	60		0.012		0.031	<0.04		0.09	1.11	1.2		1.2	
7786	3/2/82	"	18.5	4.2		8.4	2.0			7.1	61		0.012		0.034	<0.04		0.17	0.49	0.66		0.66	
8399	6/1/82	0920	27.0	surf	green	8.4	3.5			8.5	53		0.027		0.053	<0.04		0.08	0.76	0.84		0.84	
8400	6/1/82	"	27.0	4.0		7.4	4.3			8.2	52		0.025		0.053	<0.04		0.08	0.79	0.87		0.87	
8873	8/31/82	0800	30.0	surf	gray	5.6	3.3			6.3	57		0.013		0.033	<0.04		0.25	0.74	1.0		0.99	
8874			30.0	4.0		5.3	0.0			6.3	57		0.013		0.035	<0.04		0.11	0.88	1.0		0.99	
9264	11/23/82	0815	21.	surf	green	8.7	3.9			6.5	53		0.010		0.045	<0.04		0.09	1.3	1.4		1.4	
9265			21.	4.0		8.2	3.2			6.5	54		0.009		0.045	<0.04		0.14	1.5	1.6		1.6	
15182	9/3/86	0850	30.0	surf	lt grn	7.2	2.9			7.7	46.0		0.015		0.056	0.04		0.19	0.98	1.21		1.17	

45-47

ORANGE COUNTY POLLUTION CONTROL DEPARTMENT

PHYSICAL AND CHEMICAL DATA

★ (NOT FOR PUBLICATION) ★

LOCATION Lake Sue

STATION HB-36

Sample No.	Date	Cond. micro mho	Cl mg/L	Solids mg/L Total Fix.	Total Vol.	Suspended Fix.	Suspended Vol.	Secchi Disk Ft.	Turb. ~~J.T.U.~~ FTU	METALS mg/L Na	Ca	Mg	K	Fe	Cu	Pb	Zn	Cd	Al	Ni	Mn	Cr-Hexa.	Oc.
1770	10/4/72	299	16	117		0	5	5'	10.5	9.2	23.0	4.75	3.25	.05	0								
8-1374	HB36	175	15.0	118		0	0	3	3	7.40	29.7	3.55	3.10	0.05	0.01								
11-1174	HB-36(s)	200	15.0	124		5	3	4	4														
11-1174	HB-36(10)	200	14.8	122		6	1		4														
								Meters															
6453	3-17-81	264	21	157		0	5	1.0	4.4	9.9	33	3.8	3.2	0.05	<0.01								
6454	3-17-81	227	21	159		2	10		4.3	11	33	3.7	3.2	0.05	<0.01								
[illegible]	[illegible]	220	27	140		[illegible]	5	0.4	7.7	13	25	3.6	2.6	<0.05	<0.01								
[illegible]	[illegible]	330	27	146		[illegible]	7		3.2	13	28	3.5	2.6	<0.05	<0.01								
7239	9/22/81	244	—	145			—	0.6	2.9	—	—	—	—	—	—								
7240	9/22/81	244	—	149			—		2.9	—	—	—	—	—	—								
7624	12/2/81	250		172				1.5	2.8	—	—	—	—	—	—								
7625	12/2/81	230		165					3.8	—	—	—	—	—	—								
7985	3/2/82	240		140				2.6	2.4	11	25	3.5	2.4	<0.05	<0.02	—	<0.005	<0.005	<0.1	<0.04	<0.01	<0.05	
7986	3/2/82	250		140					4.2	11	23	3.5	2.4	<0.05	<0.02	—	<0.005	<0.005	<0.1	<0.04	<0.01	<0.05	
8399	6/1/82	185		120				0.8	5.5	10	30	3.5	2.2	<0.05	<0.02	—	<0.005	<0.005	—	<0.04	<0.01	<0.05	
8400	6/1/82	200		121					5.4	10	31	3.5	2.2	<0.05	<0.02	—	0.03	<0.005	—	<0.04	<0.01	<0.05	
8873	8/31/82	240		127				1.0	3.0	10	35	3.7	2.2	<0.05	<0.02	—	<0.005	<0.005	—	<0.04	0.01	<0.05	
8874		580		129					3.1	10	34	3.8	2.0	<0.05	<0.02	—	<0.005	<0.005	—	<0.04	<0.01	<0.05	
9264	11/23/82	220		121				0.9	4.5	10	30	3.2	11	<0.05	<0.02	—	<0.005	<0.005	—	<0.04	<0.01	<0.05	
9265		210		145					3.5	10	30	3.1	10	0.05	<0.02	—	<0.005	<0.005	—	<0.04	<0.01	<0.05	
15182	9/3/86	250		114.				0.8	2.4	8.02	14.24	3.33	2.28	0.025	0.006		<0.001	0.012		0.013	0.011	0.005	

45-47

ORANGE COUNTY POLLUTION CONTROL DEPARTMENT
Microbiology Summary
[NOT FOR PUBLICATION]

LOCATION Ravena

STATION 0034

SAMPLE NUMBER	FECAL INDICATORS 100ml T.C.	F.C.	F.S.	STAPH AURUS 100ml	P.AERUGINOSA 100ml	A.HYDROPHILA 100ml	STD. AEROB PER ml	P.C.35°C ANAER PER ml	H2S PROD. PER ml	ISOL PO_4 PER ml	TOTAL FUNGI	OTHER PARAMETERS	REMARKS	RE
18322 8-15-88	660E	310	120		>80	>800	1.13×10^3							[illegible]
18716 10-18-88	58	2E	20E		10E	150E	$3E \times 10^2$							[illegible]
19136 2-1-89	26E	18E	8E		2E	190E	4.5×10^2							[illegible]

45-46 (9/79)

ORANGE COUNTY POLLUTION CONTROL DEPARTMENT
PLANKTON SUMMARY

• [*NOT FOR PUBLICATION*] •

LOCATION [illegible]

STATION [illegible]

SAMPLE NUMBER	DEPTH	CHLOROPHYLL A			CHLOROPHYLL			NON AST CAROT-ENOIDS	CHLOR. A SP-	TOTAL LIVE ALGAE	MIN. NO. SPECIES	CYANOPHYTA		CHLOROPHYTA				CHRYSOPHYTA		OTHER	
		B/A	FUNCT.	N-FUNCT.	A	B	C					COCC.	FIL.	COCC.	FIL.	FLAG.	EUG	CENT	PENN.		
18322 [illegible]	[illegible]	156.6	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]		[illegible]	120	
18716 10-18-88	surf	157.8	42.1	7.9	42.0	5.4	13.2	34.3	2.1	15842	5	360	13720	660			120		1080		
17136 7-12-?	surf	155.0	14.1	3.6	16.4	1.6	6.3	9.6	1.7	19440	9	180	15720	1080				240	2220		8

45-46 (9/79)

ORANGE COUNTY POLLUTION CONTROL DEPARTMENT
Microbiology Summary
[NOT FOR PUBLICATION]

LOCATION ROWENA

STATION HB34

SAMPLE NUMBER	FECAL INDICATORS 100ml T.C.	F.C.	F.S.	STAPH AURUS 100ml	P.AERU-GINOSA 100ml	A.HYDRO PHILA 100ml	STD. AEROB PER ml	P.C.35°C ANAER PER ml	H2S PROD. PER ml	ISOL PO4 PER ml	TOTAL FUNGI	OTHER PARAMETERS	REMARKS	REV'D BY
8-172 HB34	190	10	20				780							
9-2473 HB34	> 1000	30	16				2.5×10^4							
8-574 HB34	1160	50	34				9.1×10^3							
8-1374 HB34	2400	> 500	396				6.2×10^4		—					
9-1074 HB34	1200	140	< 50				6.4×10^3							
9-1074 HB34	2600	620	< 100				7.9×10^4							
10-174 HB34	3300	< 1000	60				9.6×10^3							
10-174 HB34	520	< 1000	74				5.8×10^4							
5-1975 HB34	110	18	26				$< 3 \times 10^2$							
5-1975 HB34	120	24	44				1.3×10^2							
5-1975 HB34	960	150	670				$< 3 \times 10^2$							
6-275 HB34	< 100	< 10	< 20				Fungi O.G.							
6-275 HB34	< 100	< 10	< 20				"							
6-275 HB34	190	< 10	< 20				9.8×10^3							
6-275 HB34	480	72	690				4.3×10^2						south east corner	
10-2577 HB34	O.G.	270	42	< 100	> 200	6300	1.3×10^4						request	
11-1577 HB34	< 100	< 100	< 20	< 100	< 20		3.4×10^2							
8-1082 HB34	< 20	< 20	< 20		< 20	450								
6-2983 HB34		< 20	< 20											[illegible]
2-2885 HB34	240	80	70		22	> 800	7.2×10^2							[illegible]
17450 2-188	58	24E	78		< 10	> 800	3.9×10^2							[illegible]
dup	62	24E	90		< 10	> 800	4.8×10^2							[illegible]

45-46 (5/79)

ORANGE COUNTY POLLUTION CONTROL DEPARTMENT
PLANKTON SUMMARY
• [*NOT FOR PUBLICATION*] •

SAMPLE NUMBER	DEPTH	CHLOROPHYLL A			CHLOROPHYLL			NON AST CAROT-ENOIDS	CHLOR. A SP-	TOTAL LIVE ALGAE	MIN. NO. SPECIES	CYANOPHYTA		CHLOROPHYTA				CHRYSOPHYTA		OTHER	P.G.
		B/A	FUNCT.	N-FUNCT.	A	B	C					COCC.	FIL.	COCC.	FIL.	FLAG.	EUG.	CENT.	PENN.		
H4-2870 HB 34			35.70	5.35						Qual.	13	*		*					*	*	
H6-2171 HB 34		1.50	33.00	12.49						Qual.	3	*					*			*	
H11-2271 HB 34		1.53	27.13	7.85						Qual.	4	*	*	*							
H7-3172 HB 34		1.66	38.49	4.73	42.16	0.37	14.31			5573	6	49	5048	97	330	12			37		
H9-2473 HB 34	0-18'	1.52	22.45	7.86	27.65	2.19	0.00			153180	10		149940	2460	60	120		120	480		9
H9-2473 HB 34		1.44	30.47	17.58	41.31	6.03	2.77														
H8-574 HB 34	0-17'	1.67	42.50	1.84	44.75	0.00	0.00	47.70		40380	7		39900	180		60	120		60	60	13
H8-1374 HB 34	18'	1.55	34.48	9.30	40.60	5.50	0.00	41.70		7200	5		6060	660		300			180		
H10-174 HB 34	surf	1.67	36.09	1.52	38.07	0.00	0.00	32.40													
H10-174 HB 34	0-8	1.64	47.31	4.33	51.10	0.00	0.00	46.50		48792	13	1824	36480	7757	152	608			4912	1064	
H5-1975 HB 34	surf	1.49	40.69	16.73	50.89	1.95	8.27	64.50		51060	12		49200	840		900			120		12
H5-1975 HB 34	8'	1.52	38.49	13.71	47.54	0.48	7.32	69.60		58080	9		56760	1080		180			600		14
H5-1975 HB 34	16'	1.36	21.65	20.35	33.50	4.07	0.00	49.50		16140	7		15360	120		540					14
H11-1577 HB34	2.3*	1.73	61.31	0.00	59.12	5.60	4.07	28.80	2.05	74980	18		71040	2260		420	240		540	480	16
H12-1481 HB34	surf	1.39	4.08	3.15	5.79	2.05	1.42	2.61	2.21	540	3			60					120	360	0
H6-2983 HB34	surf	1.95	24.89	0.00	20.47	9.04	0.00	9.41	2.18												
17450 2-188	surf	1.6	20.1	1.6	21.1	2.1	2.6	9.1	2.3	2080	12	60		840		120		120	420	480	8
dup	surf	1.6	19.3	3.0	21.2	2.0	2.9	9.3	2.3												

45-46 (9/79)

* Depth in meters from this date on.

ORANGE COUNTY ENVIRONMENTAL PROTECTION DEPARTMENT
PHYSICAL and CHEMICAL DATA
NOT FOR PUBLICATION

LOCATION Lk. Rowena

CODE HB-34

Sample No.	Date	Time	Temp °C	Depth m	Odor	Color	Secchi Disk m	Cond. µmho	D.O. mg/L.	B.O.D. mg/L.	C.O.D. mg/L.	pH	Total as mg/L CaCO₃ Alk.	Total as mg/L CaCO₃ Acidity	PHOSPHORUS mg/L. Ortho	PHOSPHORUS mg/L. Total Filt.	PHOSPHORUS mg/L. Total Unfilt.	NITROGEN mg/L. NO_3	NITROGEN mg/L. NO_2	NITROGEN mg/L. NH_3	NITROGEN mg/L. Organic	NITROGEN mg/L. TKN	NITROGEN mg/L. Total	Cl mg/L.	Total Cl Res mg/L.
17450	2/1/88	9:25	16.2°	surf	none	clear	1.8	245	11.3	2.75		7.3	71.4	—	*—	0.021	0.041	0.027	<0.01	<0.04	0.293	0.293	0.320		*SEE FO[illegible]
18323	8/5/88	9:05	29.4°	surf	none	grn	—	160	5.98	3.4		6.9	50.9	—	<0.02	<0.02	0.052	0.049	<0.01	0.144	0.167	0.311	0.360		
18716	10/1/88	10:25	23.8°	"	"	"	—	210	8.2	4.5		7.0	50.3	—	0.005	0.007	0.046	0.019	<0.01	0.030	0.421	0.451	0.470		
	1988							205	8.3	3.6		7.1	57.5	—	<0.013	<0.016	0.046	0.032	<0.01	<0.07	0.294	0.352	0.383		
19136	2/1/89	8:34	20.5°	surf	none	green	1.3	205	9.6	2.9		6.8	49.7	—	0.001	0.010	0.042	0.015	<0.01	<0.01	0.137	0.137	0.152		

ORANGE COUNTY ENVIRONMENTAL PROTECTION DEPARTMENT
PHYSICAL and CHEMICAL DATA
NOT FOR PUBLICATION

LOCATION Lk. Rowena

CODE HB-34

Sample No.	Date	Turb. N.T.U.	SOLIDS mg/L Total	Suspended Fixed	Suspended Vol.	Na	Ca	Mg	K	Fe	Cu	Pb	Zn	Cd	Al	Ni	Mn	Cr	Hg	hardness					Rev by
17950	2/1/88	2.0	124.	1.5		7.07	10.16	3.45	2.01	0.027	0.022	0.005	—	0.006	0.08	0.092	0.016	0.005	—	64.55					Ti
18323	8/15/88	3.1	113.	7.5		6.36	10.79	3.14	1.21	0.033	0.020	—	0.045	<0.001	0.43	0.025	0.023	0.031		34.87					Z
18716	10/18/88	3.1	107.5	8.0		3.31	17.50	2.96	1.46	0.004	0.021	0.18	0.021	0.006	0.03	0.021	0.020	0.004		55.89					B &
	1988	2.7	114.8	5.7																					
19136	2/1/89	1.6	105.5	2.5																					

45-47 (12/86)

ORANGE COUNTY POLLUTION CONTROL DEPARTMENT
PHYSICAL AND CHEMICAL DATA
* (NOT FOR PUBLICATION) *

LOCATION LAKE ROWENA

STATION HB 34

Sample No.	Date	Time	Temp. °C	Depth	Color	D.O. mg/L	BOD mg/L	COD mg/L	Hard. mg/L CaCO3	pH	Total, as mg/L CaCO3		Phosphorous mg/L			Nitrogen mg/L					SO4		
											Alk.	Acid.	Total	Ortho	Poly	NO_3	NO_2	NH_3	Org.	Total			
9-2472	HB34	9:05	27	S-18	DK. GR.	4.9	2.4		84.6	7.9	77.8	—	0.01	0.01	0.0	.04	0	0	1.61	1.65			
8-574	HB34	9:00	28	S-17	green brown	8.5	5.5		67.9	7.9	63	3	0.040	0.010	0.030	0	.002	0	1.06	1.06			
8-1374	HB34	—	28	S-18'	lt. Green	4.1	>4.1		71.6	6.5	57	2	0.045	0.000	0.045	0.05	0.002	0	0.96	1.01			
10-174	HB-34(S)	9:45	27	Surf.	none	6.3	3.3			7.4	64	2	0.019	0.009	0.010	0.03	0	0	0.97	1.00			
10-174	HB-34(B)	9:45	28	S-16.6'	"	—	—			7.5	63	2	0.014	0.009	0.005	0.01	0	0	1.00	1.01			
5-1975	HB-34(S)	9:00	27	Surf	DK BRN	7.9	4.4			8.3	49	0	0.038	0.005	0.033	0.62	0.003	0	1.23	1.25			
5-1975	HB-34(M)	9:05	27	8'	"	7.6	3.7			8.3	51	0	0.027	0.002	0.025	0.02	0.001	0	1.08	1.10			
5-1975	HB-34(B)	9:10	26	16'	"	0.6	4.5			7.0	54	6	0.038	0.002	0.038	0.02	0.001	0.12	1.01	1.05			
1103	11-15-77	0930	20	2.3	NC GRN		3.9	32.			59.		0.025	<0.010	0.015	<0.10	-	1.2					
													Filt		unfilt						TRW		
12371	6/29/83	0825	29.5	Surf	lt grn	9.2				8.8	55		0.020		0.050	<0.04				1.38	1.38		

45-47

ORANGE COUNTY POLLUTION CONTROL DEPARTMENT
PHYSICAL AND CHEMICAL DATA
* (NOT FOR PUBLICATION) *

LOCATION LAKE ROWENA

STATION HB 34

Sample No.	Date	Cond. micro mho	Cl mg/L	Solids mg/L Total Fix.	Solids mg/L Total Vol.	Solids mg/L Suspended Fix.	Solids mg/L Suspended Vol.	Secchi Disk Ft.	Turb. J.T.U.	METALS mg/L Na	Ca	Mg	K	Fe	Cu	Pb	Zn	Cd	Al			Cr-Hexa-	O
9-24-73	HB34	235	18	141		2	8	3½'	4	7.75	22.8	4.3	2.25	0.10	0.01								
8-5-74	HB34	246	11.9	122		0	7	2'4"	4	6.85	21.9	3.20	1.85	0.15	0.01								
8-13-74	HB34	185	13.8	114		0	0	3	4	6.85	23.5	3.25	1.85	0.00	0.01								
10-1-74	HB-34(S)	210	13.5	123		4	6	2'6"	3														
10-1-74	HB-34(C)	200	13.5	129		3	15	2'6"	4														
5-19-75	HB34(S)	135	17	127		0	6	2'	4														
5-19-75	HB-34(M)	170	18	129		1	15		4														
5-19-75	HB-34(B)	185	17	120		2	4		5														
11 03	11-15-77		18.	128.		3.0	7.0		2.9	9.6	28.	3.0	2.4	<0.050	<0.010								
12371	6/29/83	185																					

45-47

APPENDIX D

BENTHIC MACROINVERTEBRATE DATA

Orange County

Environmental Protection De
J. M. Bateman, P.E., Man
2002 East Michigan Stre
Orlando, Florida 32806-4
Telephone (407) 244-74

May 1, 1989

Memorandum

To: Rick Baird, Laboratory Coordinator

From: Mary Ann Halvorsen, Biological Specialist MAH

Subject: April 28, 1989 Memorandum on Lake
Macroinvertebrate Data

The Shannon-Weaver Diversity Indices reported on
the April 28, 1989 Lake Rowena Macroinvertebrate
recalculated due to information received from the
Environmental Regulations. This change impacts and
first sentence of paragraph #2 to be deleted. Attached
appended Table I. The results indicate that no
occurred in the macroinvertebrate species composition
detected at this time.

MAH/bl

cc: Linda Mingarelli-Jennings

Orange County

Environmental Protection Department
J. M. Bateman, P.E., Manager
2002 East Michigan Street
Orlando, Florida 32806-4999
Telephone (407) 244-7400

May 5, 1989

Memorandum

To: Rick Baird, Laboratory Coordinator

From: Mary Ann Halvorsen, Biological Specialist

Subject: Lake Sue Macroinvertebrate Data

Enclosed is the macroinvertebrate data on Lake Sue that was collected on March 20, 1989 (Winter Quarter '89). Only three sample locations are necessary for a lake this size, therefore one station was eliminated. (see Appendix I). Table I lists all the Shannon-Weaver Diversity Indices compiled since the beginning of this project. I was also able to calculate a Composite Shannon-Weaver Diversity Index from the three sample points on Lake Sue during March. Table II lists the field data obtained on the date of sampling.

Station 3S on Lake Sue contained eleven of the Class II species <u>Polypedilum</u> <u>halteraie</u>. This is classified as such as only able to tolerate small amounts of organic pollution.

The substrate at station 3S was of sand, all other stations contained muck. A general conclusion can be drawn stating that a sand habitat will contain more pollution intolerant species than a muck habitat.

No significant changes have occurred in the macroinvertebrate species composition that can be detected at this time. Additional sampling is necessary to better evaluate the dynamics of the macroinvertebrate population. If you have any questions or comments please let me know.

MAH/bl

cc: Linda Mingarelli-Jennings

TABLE I

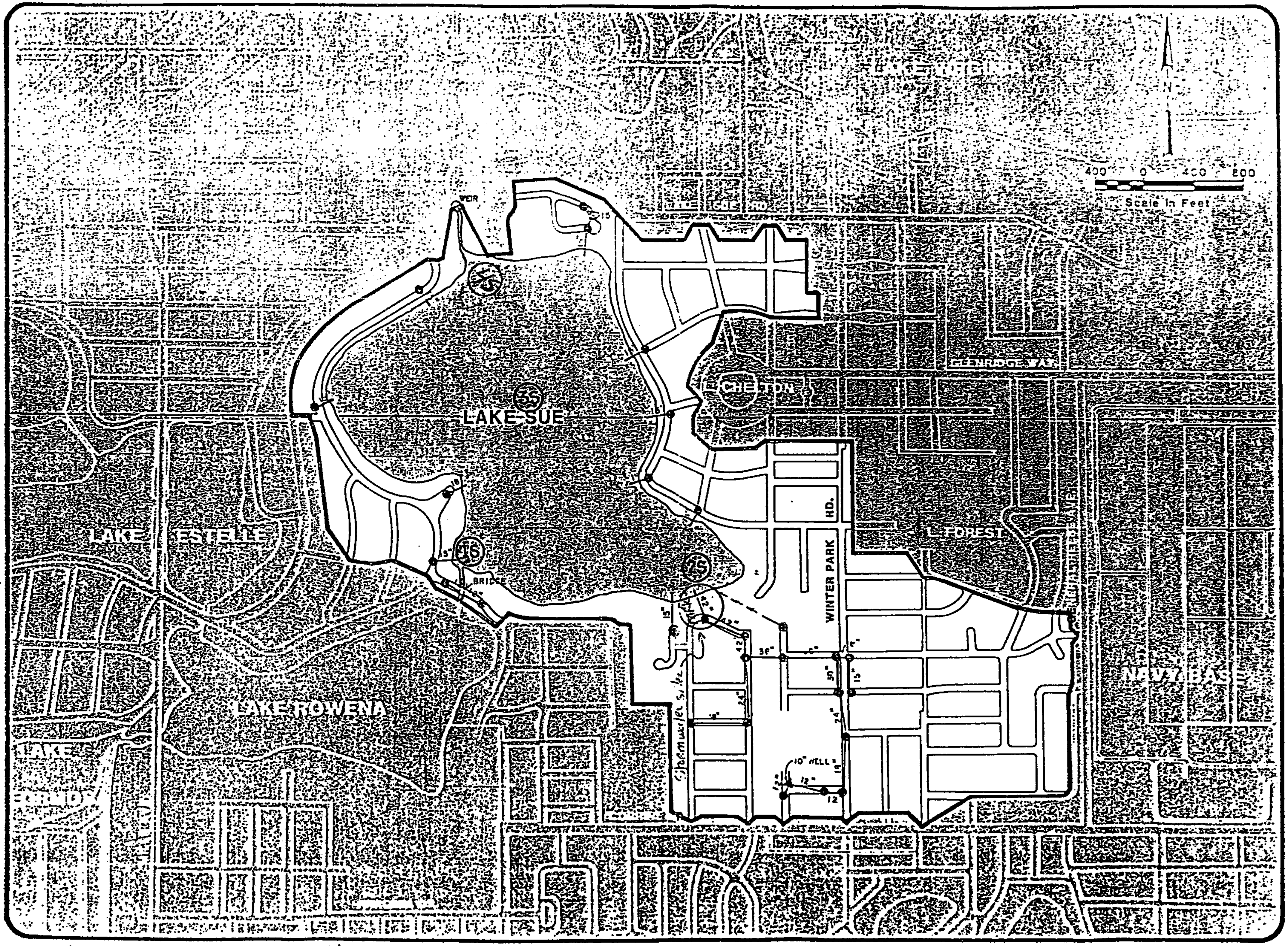
Location	March 20, 1989 Winter '89	August 4, 1988 Summer '88	March 20, 1989 Winter '89
1S	0.927	0.734	0.847
2S	1.253	1.566	1.842
3S	1.591	1.413	0.859
4S	---	2.961	1.339

TALBE II

Date	Location	pH	Conductivity	D.O.	Temp.
3/20/89	1S	8.56s 8.33b	230 umhos	8.5 mg/Ls 0.7 mg/Lb	23.0°Cs 16.5°Cb
3/20/89	2S	8.09s 8.50b	186 umhos	8.8 mg/Ls 0.7 mg/Lb	23.0°Cs 19.0°Cb
3/20/89	3S	8.5s 8.4b	190 umhos	8.6 mg/Ls 4.0 mg/Lb	23.°Cs 19.0°Cb

Date	Location	Depth	Secchi
3/20/89	1S	6.0m	2.0m
3/20/89	2S	4.75m	2.75m
3/20/89	3S	4.0m	3.0m

APPENDIX I



400 0 400 800
Scale In Feet
LAKE SUE
WINTER PARK RD.
LAKE ESTELLE
LAKE ROWENA
L. FOREST
GLENRIDGE WAY
BRIDGE
WEIR
10" WELL

APPENDIX II

Shannon-Weaver Diversity Index

$\bar{d} = -\Sigma\ (ni/n)\ \log 2\ (ni/n$

Where d = diversity
s = total number of species
ni= number of individuals in each species
n = total number of individuals in the sample

Diversity Index ranges are indicated in the following:

Ø-1 indicates a grossly polluted stream
1-3 indicates a moderate level of pollution in a stream
> 3 indicates a clean water area
(Whilm and Dorris, 1968)

*Composite Diversity Index is dervied at by combining all the species collected at each station within the lake and incorporating that data into the $\bar{d}$ formula.

APPENDIX III

The Biotic Index = 2 (# of Class I species) + (# of Class II species)

Biotic Index ranges are indicative of the following:

BI=0 indicates grossly polluted streams
BI=1-6 indicates a moderately polluted stream
BI>10 indicates a clean stream area
BI=4-9 could indicate a clean stoam with monotonous habitat and low velocity (Beck, 1955)

The classification of the macroinvertebrates are as follows:

Class I those organisms that are intolerant of organic pollution.

Class II those organisms that are only moderately tolerant of organic pollution.

Class III those organisms that can tolerate gross amounts of organic pollution.

Class IV air breathing organisms

Class V those organisms that lack the pollution tolerance data to qualify their placement elsewhere.

Orange County

Environmental Protection Department
J. M. Bateman, P.E., Manager
2002 East Michigan Street
Orlando, Florida 32806-4999
Telephone (407) 244-7400

August 31,1988

TO: Rick Baird, Laboratory Supervisor

FROM: Liz Olson, Microbiologist

SUBJECT: Lakes Sue and Rowena Macroinvertebrate Data

Attached is the summer data on Lakes Sue and Rowena. The differences between this data set and the spring data set is mostly attributed to seasonal variations and the emergence of a large amount of flying insects. There may, however, been one other factor which resulted in varying indices. This will be discussed below with the accompanying data.

	SPRING	SUMMER
1R	.879	.169
2R	2.306	.579
1S	.847	.734
2S	1.842	1.566
3S	**.859**	**1.413**
4S	**1.339**	**2.961**

The first four sample points, both Rowena points and the first two Sue points, all show a decline in their diversity indices. The last two points, both for Sue, increased in diversity. It is quite possible that this was due to the change in the sampling methodology. A discussion with the Orlando D.E.R. office led to a changing of the amount of grabs made at each sample point. In the past we had been taking two-three grabs and the resulting efforts to sort through these proved to be extensive. The D.E.R. personnel informed me that a grab yielding ≥ 15 organisms would constitute a viable sample. In view of the extensive numbers collected in the past, it was obvious that a single grab would give us a viable data set. Therefore, the methodology was changed in order to enable staff to sort through the samples within the required 24 hours. (Also verified by D.E.R.)

Below is a **brief** discussion on possible reasons for changed diversities at each sample point.

1R---two fewer species found and an increase in total numbers.

2R---six species of chironomids (midgefly larvae) found in the Spring are absent from this sample.

1S---very close diversities; slight increase in total numbers.

2S---four species of chironomids (midgefly larvae) found in Spring are absent from this sample.

3S---methodology difference; shared dominance in Summer as opposed to single dominance in Spring.

4S---methodology difference; increase in species.

If any further explanation or information is needed please let me know.

SUMMER 88

LAKE ROWENA 1R

```
  SHANNON-WEAVER INDEX CALCULATION.
  INPUT THE FOLLOWING INFORMATION:
ENTER TOTAL # SPECIES? 2
ENTER # OF INDIVIDUALS FOR EACH SPECIES:
? 240
ENTER # OF INDIVIDUALS FOR EACH SPECIES:
 SPECIES #  1   ? 234
 SPECIES #  2   ? 6
SHANNON-WEAVER INDEX = .1686566
DO YOU WANT ANOTHER CALCULATION ?(Y/N)
?
```

MACROINVERTEBRATE DATA SHEET

STATION: LAKE ROWENA 1R REP: INCUBATION: 04AUG88

SET BY: N/A COLLECTED: EJO SORTED BY: ~~EJO~~ BL

ANALYST (CHIR) EJO ANALYST (OTHER): EJO

DATE CHIR. COMPLETED: 22AUG88 DATE OTHER COMPLETED: 22AUG88

ORGANISM	BI	TALLY	#/m2	ORGANISM	BI	TALLY	#/m2
Chaoborus sp. 234		[illegible]					
OLIGOCHAETA 6		𝍸 I					
				2/240			

COMMENTS:

LAKE ROWENA 2R

```
  SHANNON-WEAVER INDEX CALCULATION.
  INPUT THE FOLLOWING INFORMATION:
ENTER TOTAL # SPECIES? 2
ENTER # OF INDIVIDUALS FOR EACH SPECIES:
? 406
ENTER # OF INDIVIDUALS FOR EACH SPECIES:
 SPECIES #  1   ? 350
 SPECIES #  2   ? 56
SHANNON-WEAVER INDEX = .5787798
DO YOU WANT ANOTHER CALCULATION ?(Y/N)
?
```

MACROINVERTEBRATE DATA SHEET

STATION: LAKE ROWENA 2R REP: ~~2Q Q~~ INCUBATION: 04AUG88

SET BY: N/A COLLECTED: EJO SORTED BY: ~~BE~~ EJO

ANALYST (CHIR) EJO ANALYST (OTHER): EJO

DATE CHIR. COMPLETED: 23AUG88 DATE OTHER COMPLETED: 22AUG88

ORGANISM	BI	TALLY	#/m2	ORGANISM	BI	TALLY	#/m2
Chaoborus sp. 350							
OLIGOCHAETA 56	3						
				2			
				406			

COMMENTS:

LAKE SUE 1S

```
  SHANNON-WEAVER INDEX CALCULATION.
  INPUT THE FOLLOWING INFORMATION:
ENTER TOTAL # SPECIES? 2
ENTER # OF INDIVIDUALS FOR EACH SPECIES:
? 102
ENTER # OF INDIVIDUALS FOR EACH SPECIES:
 SPECIES #  1   ? 81
 SPECIES #  2   ? 21
SHANNON-WEAVER INDEX = .7335191
DO YOU WANT ANOTHER CALCULATION ?(Y/N)
? y
```

MACROINVERTEBRATE DATA SHEET

STATION: LAKE SUE IS REP: INCUBATIO

SET BY: N/A COLLECTED: EJO SORTED BY

ANALYST (CHIR) EJO ANALYST (OTHER): EJO

DATE CHIR. COMPLETED: 23AUG88 DATE OTHER COMPLETED: 23AUG88

ORGANISM	BI	TALLY	#/m2	ORGANISM
Chaoborus sp. 81		HHT HHT HHT HHT HHT HHT HHT HHT HHT HHT HHT HHT HHT HHT HHT HHT I		
OLIGOCHAETA 21		HHT HHT HHT HHT I		
				2/102

COMMENTS:

MACROINVERTEBRATE DATA SHEET

STATION: LAKE SUE 25 REP: INCUBATION: 15 AUG88

SET BY: N/A COLLECTED: EJO SORTED BY: EJO

ANALYST (CHIR) EJO ANALYST (OTHER): EJO

DATE CHIR. COMPLETED: 25AUG88 DATE OTHER COMPLETED: 25AUG88

ORGANISM	BI	TALLY	#/m2	ORGANISM	BI	TALLY	#/m2
Chaoborus sp.		𝍸					
				3 / 15			
OLIGOCHAETA		IIII					
NEMATODA		𝍸 I					

COMMENTS:

LAKE SUE 35

```
  SHANNON-WEAVER INDEX CALCULATION.
  INPUT THE FOLLOWING INFORMATION:
ENTER TOTAL # SPECIES? 3
ENTER # OF INDIVIDUALS FOR EACH SPECIES:
? 212
ENTER # OF INDIVIDUALS FOR EACH SPECIES:
 SPECIES #  1    ? 104
 SPECIES #  2    ? 27
 SPECIES #  3    ? 81
SHANNON-WEAVER INDEX = 1.413
DO YOU WANT ANOTHER CALCULATION ?(Y/N)
? y
D
```

MACROINVERTEBRATE DATA SHEET

STATION: LAKE SUE ;35 REP: INCUBATION: 15 AUG 88

SET BY: N/A COLLECTED: EJO SORTED BY: EJO

ANALYST (CHIR) EJO ANALYST (OTHER): EJO

DATE CHIR. COMPLETED: 29 AUG 88 DATE OTHER COMPLETED: 25 AUG 88

ORGANISM	BI	TALLY	#/m2	ORGANISM	BI	TALLY	#/m2
Chaoborus sp. 104		[illegible]					
OLIGOCHAETA 27		[illegible]					
NEMATODA 81		[illegible]		3/212			

COMMENTS:

LAKE SUE 4S

```
  SHANNON-WEAVER INDEX CALCULATION.
  INPUT THE FOLLOWING INFORMATION:
ENTER TOTAL # SPECIES? 12
ENTER # OF INDIVIDUALS FOR EACH SPECIES:
? 31
ENTER # OF INDIVIDUALS FOR EACH SPECIES:
 SPECIES #  1   ? 4
 SPECIES #  2   ? 12
 SPECIES #  3   ? 1
 SPECIES #  4   ? 1
 SPECIES #  5   ? 1
 SPECIES #  6   ? 1
 SPECIES #  7   ? 2
 SPECIES #  8   ? 2
 SPECIES #  9   ? 3
 SPECIES #  10   ? 1
 SPECIES #  11   ? 1
 SPECIES #  12   ? 2
SHANNON-WEAVER INDEX = 2.961396
DO YOU WANT ANOTHER CALCULATION ?(Y/N)
?
```

MACROINVERTEBRATE DATA SHEET

STATION: LAKE SUE, 45 REP: INCUBATION: 15 AUG 88

SET BY: N/A COLLECTED: EJD SORTED BY: ~~EJD~~ BL

ANALYST (CHIR) EJD ANALYST (OTHER): EJD

DATE CHIR. COMPLETED: 30 AUG 88 DATE OTHER COMPLETED: 29 AUG 88

ORGANISM	BI	TALLY	#/m2	ORGANISM	BI	TALLY	#/m2
Chaoborus sp.		IIII					
OLIGOCHAETA	3	~~IIII~~ ~~IIII~~ II					
Bezzia sp.		I					
NEMATODA		I		12			
				31			
~~Coral~~							
Ceraclea sp.	5	I					
Parachironomus hirtalatus	5	I					
Glyptotendipes lobiferus	3	II					
Dicrotendipes lobus	5	II					
Xenochironomus sp.	5	III					
Glyptotendipes paripes	3	I					
Ablabesmyia peleensis		I					
Polypedilum halterale	2	II					

COMMENTS:

LAKE ROWENA 1R

```
  SHANNON-WEAVER INDEX CALCULATION.
  INPUT THE FOLLOWING INFORMATION:
ENTER TOTAL # SPECIES? 4
ENTER # OF INDIVIDUALS FOR EACH SPECIES:
? 151
ENTER # OF INDIVIDUALS FOR EACH SPECIES:
 SPECIES #  1   ? 115
 SPECIES #  2   ? 1
 SPECIES #  3   ? 34
 SPECIES #  4   ? 1
SHANNON-WEAVER INDEX = .8794081
DO YOU WANT ANOTHER CALCULATION ?(Y/N)
?
```

(1)

MACROINVERTEBRATE DATA SHEET

STATION: LK. ROWENA 1R ~~REP~~: LR 1R 880420 ~~INCUBATION~~: 20 APRIL 88

~~SET BY:~~ COLLECTED: BF/ESO/CNP SORTED BY: BL

ANALYST (CHIR) ESO ANALYST (OTHER): ESO

DATE CHIR.COMPLETED: 27AP88 DATE OTHER COMPLETED: 25AP88

ORGANISM	BI	TALLY	~~#/m2~~	ORGANISM	BI	TALLY	#/m2
Chaoborus sp.	5	𝍸𝍸𝍸𝍸𝍸𝍸𝍸𝍸𝍸𝍸𝍸𝍸𝍸𝍸𝍸𝍸𝍸𝍸𝍸𝍸𝍸𝍸𝍸	115				
NEMATODA	5	1	1				
OLIGOCHAETA (ONE)	3	𝍸𝍸𝍸𝍸𝍸𝍸 1111	34				
Glyptotendipes lobiferus	3	1	1				

4 / 151

COMMENTS: SUBSTRATE: HEAVY LEAF LITTER, TWIGS, PARTIALLY DECAYED VEG.

LAKE ROWENA 2R

```
Y
  SHANNON-WEAVER INDEX CALCULATION.
  INPUT THE FOLLOWING INFORMATION:
ENTER TOTAL # SPECIES? 11
ENTER # OF INDIVIDUALS FOR EACH SPECIES:
? 108
ENTER # OF INDIVIDUALS FOR EACH SPECIES:
 SPECIES #  1   ? 45
 SPECIES #  2   ? 28
 SPECIES #  3   ? 5
 SPECIES #  4   ? 1
 SPECIES #  5   ? 18
 SPECIES #  6   ? 2
 SPECIES #  7   ? 4
 SPECIES #  8   ? 1
 SPECIES #  9   ? 2
 SPECIES #  10   ? 1
 SPECIES #  11   ? 1
SHANNON-WEAVER INDEX = 2.30661
DO YOU WANT ANOTHER CALCULATION ?(Y/N)
```

1ACROINVERTEBRATE DATA SH. T

2

STATION: LR. ROWENA 2R ~~REP~~: LR2R 880420 ~~INCUBATION~~: 20 APRIL 88

~~SET~~ BY: ______ COLLECTED: BF/EJO/CNP SORTED BY: VH/BL

ANALYST (CHIR) EJO ANALYST (OTHER): EJO

DATE CHIR. COMPLETED: 10 MAY 88 DATE OTHER COMPLETED: 25 APRIL 88

ORGANISM	BI	TALLY	#/m2	ORGANISM	BI	TALLY	#/m2
Chaoborus sp.	5	45					
OLIGOCHAETA (ONE)	3	28					
OLIGOCHATA (TWO)	3	5					
Hyalella azteca		1	1				
~~Cryptochironomus sp.~~	~~3~~	1					
~~Cryptotendipes sp.~~							
Cryptocladopelma edwardsi		13					
Cryptochironomus fulvus	3	2					
Paracladopelma sp.	5	4					
Tanypus stellatus	3	1					
Procladius sp.		2					
Chironomus stigmaterus	3	1					
				Bezzia sp.	3	1	

11 / 108

COMMENTS: SUBSTRATE: DETRITUS & LEAF LITTER

OLIGOCHAETA (ONE) CHARACTERIZED BY SIZE (7-10 mm) LACK OF BRISTLE HAIR CLUMPS, PALE COLOR. OLIGOCHAETA (TWO) CHARACTERIZED BY SIZE (3-5 mm), PRESENCE OF HAIR(S) ON LATERAL EDGE OF EACH SEGMENT, TAN/YELLOW COLOR.

LAKE SUE 1S

```
? Y
  SHANNON-WEAVER INDEX CALCULATION.
  INPUT THE FOLLOWING INFORMATION:
ENTER TOTAL # SPECIES? 3
ENTER # OF INDIVIDUALS FOR EACH SPECIES:
? 59
ENTER # OF INDIVIDUALS FOR EACH SPECIES:
 SPECIES #  1   ? 12
 SPECIES #  2   ? 46
 SPECIES #  3   ? 1
SHANNON-WEAVER INDEX = .8469705
DO YOU WANT ANOTHER CALCULATION ?(Y/N)
```

3

ACROINVERTEBRATE DATA SHE

STATION: LK SUE IS ~~REP~~: LS IS 880420 ~~INCUB~~ATION: 20 APRIL 88

~~SET BY:~~ COLLECTED: EJO/CNP SORTED BY: EJO

ANALYST (CHIR) EJO ANALYST (OTHER): EJO

DATE CHIR.COMPLETED: 25 APRIL 88 DATE OTHER COMPLETED: 25 APRIL 88

ORGANISM	BI	TALLY	~~#/m2~~	ORGANISM	BI	TALLY	#/m2
Chaoborus sp.	5	~~||||~~ ~~||||~~ ||	12				
OLIGOCHAETA (ONE)	3	~~||||~~ ~~||||~~ ~~||||~~ ~~||||~~ ~~||||~~ ~~||||~~ ~~||||~~ ~~||||~~ ~~||||~~ |	46				
				3/59			
Bezzia sp.		|	1				

COMMENTS: SUBSTRATE: DETRITUS MIXED WITH LARGE AMOUNTS OF FILAMENTOUS ALGAE

LAKE SUE 2S

```
? Y
  SHANNON-WEAVER INDEX CALCULATION.
  INPUT THE FOLLOWING INFORMATION:
ENTER TOTAL # SPECIES? 7
ENTER # OF INDIVIDUALS FOR EACH SPECIES:
? 99
ENTER # OF INDIVIDUALS FOR EACH SPECIES:
 SPECIES #  1   ? 23
 SPECIES #  2   ? 43
 SPECIES #  3   ? 28
 SPECIES #  4   ? 1
 SPECIES #  5   ? 2
 SPECIES #  6   ? 1
 SPECIES #  7   ? 1
SHANNON-WEAVER INDEX = 1.841661
DO YOU WANT ANOTHER CALCULATION ?(Y/N)
```

..ACROINVERTEBRATE DATA SHE..

(4)

STATION: LK SUE 25 ~~REP:~~ L.S. 25 880420 INCUBATION: 20 APRIL88

~~SET BY:~~ COLLECTED: EJO/CNP SORTED BY: EJO

ANALYST (CHIR) EJO ANALYST (OTHER): EJO

DATE CHIR. COMPLETED: 16MAY88 DATE OTHER COMPLETED: 25 APRIL88

ORGANISM	BI	TALLY	~~#/m2~~	ORGANISM	BI	TALLY	#/m2
Chaoborus sp.	5	卌 卌 卌 卌 III	23				
NEMATODA	5	卌 卌 卌 卌 卌 卌 卌 卌 III	43				
OLIGOCHAETA (ONE)	3	卌 卌 卌 卌 卌 III	28				
Polypodium ~~fallax~~ illinoense		I					
Cryptotendipes sp.	.	II					
Glyptotendipes paripes	.	I					
Procladius sp.	.	I					

COMMENTS: SUBSTRATE: MUCK, SILT WITH WORM CASINGS (TUBES OF SILT)

LAKE SUE 3S

```
? Y
  SHANNON-WEAVER INDEX CALCULATION.
  INPUT THE FOLLOWING INFORMATION:
ENTER TOTAL # SPECIES? 3
ENTER # OF INDIVIDUALS FOR EACH SPECIES:
? 69
ENTER # OF INDIVIDUALS FOR EACH SPECIES:
 SPECIES #  1   ? 15
 SPECIES #  2   ? 53
 SPECIES #  3   ? 1
SHANNON-WEAVER INDEX = .8594713
DO YOU WANT ANOTHER CALCULATION ?(Y/N)
```

(5)

MACROINVERTEBRATE DATA SHEET

STATION: LK SUE 35 ~~REP~~: L.S.35 880420 INCUBATION: 20 APRIL 88

~~SET BY:~~ COLLECTED: EJO/CNP SORTED BY: BL

ANALYST (CHIR) EJC ANALYST (OTHER): EJO

DATE CHIR. COMPLETED: 16 MAY 88 DATE OTHER COMPLETED: 25 APRIL 88

ORGANISM	BI	TALLY	~~#/m2~~	ORGANISM	BI	TALLY	#/m2
Chaoborus sp.	5	~~||||~~ ~~||||~~ ~~||||~~	15				
OLIGOCHAETA (OLE)	3	~~||||~~ ~~||||~~ ~~||||~~ ~~||||~~ ~~||||~~ ~~||||~~ ~~||||~~ ~~||||~~ ~~||||~~ ~~||||~~ |||	53				
c.f. Glyptotendipes paripes		1					

3 / 69

COMMENTS: SUBSTRATE: DETRITUS

LAKE SUE 4S

```
? Y
  SHANNON-WEAVER INDEX CALCULATION.
  INPUT THE FOLLOWING INFORMATION:
ENTER TOTAL # SPECIES? 11
ENTER # OF INDIVIDUALS FOR EACH SPECIES:
? 161
ENTER # OF INDIVIDUALS FOR EACH SPECIES:
 SPECIES #  1   ? 123
 SPECIES #  2   ? 20
 SPECIES #  3   ? 1
 SPECIES #  4   ? 6
 SPECIES #  5   ? 3
 SPECIES #  6   ? 2
 SPECIES #  7   ? 1
 SPECIES #  8   ? 1
 SPECIES #  9   ? 1
 SPECIES #  10   ? 1
 SPECIES #  11   ? 2
SHANNON-WEAVER INDEX = 1.339376
DO YOU WANT ANOTHER CALCULATION ?(Y/N)
? N
Ok
```

..ACROINVERTEBRATE DATA SHE..

STATION: LK. SUE 4S ~~REP~~: L.S. 4S 880420 ~~INCUBATION~~: 20 APRIL 88

~~SET BY:~~ COLLECTED: EJO/CNP SORTED BY: EJO

ANALYST (CHIR) EJO ANALYST (OTHER): EJO

DATE CHIR. COMPLETED: 16 MAY 88 DATE OTHER COMPLETED: 25 APRIL 88

ORGANISM	BI	TALLY	~~#/m2~~	ORGANISM	BI	TALLY	#/m2
Chaoborus sp.	5		123				
OLIGOCHAETA (ONE)	3		20				
Hyalella azteca		I					
NEMATODA	5	~~IIII~~ I					
Glyptotendipes paripes	3	III					
~~Goeldichironomus holoprasinus~~	~~3~~						
Cryptocladopelma edwardsi		II					
Chironomus cavus		I					
Cryptotendipes sp.		I					
Leptochironomus sp.		I					
Tanytarsus sp. sp. III (Olson)		I					
				Bezzia sp.		II	

11/161

COMMENTS: SUBSTRATE: FILAMENTOUS ALGAE, DECOMPOSING VEG.

(6)

..ACROINVERTEBRATE DATA SHE..

STATION: LK. SUE 4S ~~REP~~: L.S. 4S 880420 ~~INCUBATION~~: 20 APRIL 88

~~SET BY:~~ COLLECTED: EJO/CNP SORTED BY: EJO

ANALYST (CHIR) EJO ANALYST (OTHER): EJO

DATE CHIR. COMPLETED: 16 MAY 88 DATE OTHER COMPLETED: 25 APRIL 88

ORGANISM	BI	TALLY	~~#/m2~~	ORGANISM	BI	TALLY	#/m2
Chaoborus sp.	5		123				
OLIGOCHAETA (ONE)	3		20				
Hyalella azteca		I					
NEMATODA	5	~~IIII~~ I					
Glyptotendipes paripes	3	III					
~~Goeldichironomus holoprasinus~~	~~3~~						
Cryptocladopelma edwardsi		II					
Chironomus carus		I					
Cryptotendipes sp.		I					
Leptochironomus sp.		I					
Tanytarsus sp. sp. III (OLSON)		I					
				Bezzia sp.		II	

11 / 161

COMMENTS: SUBSTRATE: FILAMENTOUS ALGAE, DECOMPOSING VEG.

APPENDIX E

VEGETATION SURVEYS OF LAKE SUE

GROVE SCIENTIFIC

May 10, 1990

Mr. David W. Zeno, P.E.
City of Orlando
Engineering Department
400 South Orange Avenue
Orlando, Florida 32801

Re: Lake Sue Improvement Association
Lake Rowena Inflow Cleanup
STORMS Priority Project No. 89-413

Dear Dave:

The Lake Sue Improvement Association was recently awarded a $25,000 grant from the Florida Department of Environmental Regulation and an additional $10,000 from the City of Winter Park for a shoreline revegetation project. These monies were awarded at least in part because of the multi-agency and municipality participation. For this, we want to thank you for the City of Orlando's continued support on the Lake Sue/Rowena project.

One of the conditions of this award is that we proceed with the projects we outlined in our proposal to the F.D.E.R. (I have enclosed a copy for your reference, in the event you haven't received one). Included in this list of projects is stormwater abatement within the Lake Rowena drainage basis, specifically the project referenced above.

The Lake Sue Advisory Board has requested that I contact you to obtain a projected date for diverting a portion of the flow from Colonial Plaza to Fern Creek, as outlined in your project description. They emphasize that this is considered an important first step in improving the upper Howell Branch chain of lakes.

Please respond as soon as possible, since we are planning an annual meeting of the association members in early June, and I have to report on this subject. Your attention to this request is appreciated, and I can be reached by telephone at (407) 298-2282.

Respectfully,

Grove Scientific Company,

Bruno A. Ferraro
President

cc: Lake Sue Advisory Board
Bill Pence

05-009.00

6140 EDGEWATER DRIVE ■ SUITE F ■ ORLANDO, FLORIDA 32810-4810 ■ (407) 298-2282 ■ FAX (407) 290-9038

Verified ____/____

DATE	SURV	WMD	COUNTY	WATER BODY	CODE	ACREAGE	TYPE	CLASS	PROGRAM	ACCESS	MAINT
890329	08/23	SJ	48	21430		140	L	3	2	V	S

COOPERATOR: OBP / CWP

* Explain below species & acreage of problem vegetation, and possible solution for gaining control. Include map of water body with location of problem vegetation.

HVA COMPETING WITH P/S, NGS, CDM, & NIT

Water Management District		Water Class (DER)		Access		Water Type		Control Program	
SFWMD	SF	Class 1 (Potable)	1	None	N	River	R	None	0
SWFWMD	SW	Class 2 (Shellfish)	2	Public	P	Canal	C	Private	1
SJWMD	SJ	Class 3 (Others)	3	Private	V	Lake	L	Local Fund	2
SRWMD	SR	Class 4 (Agriculture)	4			Brackish	B	State Fund	3
NWFWMD	NW					Marine	M	Federal Fund	4

County Codes

Alachua	01	Flagler	18	Lake	35	Pinellas	52
Baker	02	Franklin	19	Lee	36	Polk	53
Bay	03	Gadsden	20	Leon	37	Putnam	54
Bradford	04	Gilchrist	21	Levy	38	St. Johns	55
Brevard	05	Glades	22	Liberty	39	St. Lucie	56
Broward	06	Gulf	23	Madison	40	Santa Rosa	57
Calhoun	07	Hamilton	24	Manatee	41	Sarasota	58
Charlotte	08	Hardee	25	Marion	42	Seminole	59
Citrus	09	Hendry	26	Martin	43	Sumter	60
Clay	10	Hernando	27	Monroe	44	Suwannee	61
Collier	11	Highlands	28	Nassau	45	Taylor	62
Columbia	12	Hillsborough	29	Okaloosa	46	Union	63
Dade	13	Holmes	30	Okeechobee	47	Volusia	64
DeSoto	14	Indian River	31	Orange	48	Wakulla	65
Dixie	15	Jackson	32	Osceola	49	Walton	66
Duval	16	Jefferson	33	Palm Beach	50	Washington	67
Escambia	17	Lafayette	34	Pasco	51	Intercounty Waters	99

Problem Rating

None	0
Moderate	1
Severe	2

* Maintenance

No Aquatic Plant Problem	N
Aquatic Plants Under Satisfactory Control	S
Aquatic Plants Require Maintenance	M

Rev. 4/88

APPENDIX F

LAKE SUE D.N.R PERMIT APPLICATION

and

SKETCH OF A TYPICAL PLANTING SCHEME

PLEASE NOTE

THIS PERMIT WILL BE ISSU TO THE LAKE SUE ADVISORY BOARD PRESIDENT, KEN TINSLE WILL APPLY TO ALL HOMEOWNERS AROUND THE LAK

THROUGH A JOINT E COUNTY ENVIRONMENTAL PROTECTION DEPT., CI HE LAKE SUE ADVISORY BOARD, AND GROVE S MANAGEMENT PLAN IS BEING DEVELOPED F RS WOULD LIKE TO CLEAR 30 FOOT A HEIR REMAINING LAKEFRONTS WI

Rowena

THER E, AND THE ACREAGFES LS, NOT AMOUNTS FOR

DEPARTMENT OF NATURAL RESOURCES

JUDITH A. LUDLOW
DEPARTMENT OF NATURAL RESOURCES
BUREAU OF AQUATIC PLANT MANAGEMENT
4378 L. B. McLEOD ROAD, UNIT 8
ORLANDO, FLORIDA 32811

APPLICATION FOR AQUATIC PLANT CONTROL PERMIT

1. Applicants Name Mr. Ken Tinsley, President

4. Date Filed 8-1-89

Signature [signature]

Address Lake Sue Advisory Board
3327 Lakeshore Drive
Orlando, Fl. 32803

Date received
Complete ___ Surveyed
To GFC ___ From GFC
Transmittal #
Permit #
Reviewer

2. Telephone # H- 896-1391 (407) w-(407) 644-6388

3. Certification # N/A

5. Briefly explain how aquatic plants are restricting the water use. Request to replant shoreline with native plants, allow for access to open water.

6. Attach a map with directions, using state or U.S. highway route numbers when possible, to locate the water body. Also attach a map of the water body indicating the location of the vegetation desired for control.

7. Type of Control Requested:

[✓] Chemical [✓] Mechanical* [ ] Water Level Fluctuation+

Water Body			Control Information		
Name or Number	Surface Acreage	County	Target Plants	Treatment Area (acres)	Chemica to be Used
Lake Sue	140	Orange	Torpedograss	3.00	Rodeo, Hand remov
			Elephant ear	1.0	"
			Alligatorweed	1.0	"
			Primrose Willow	1.0	"
			Hydrilla	3.0	Diquat, Aquathol Hand remove

8. Public Notification Procedures (Check Appropriately) → over → → →

✓ Signs Posted at Access Points
✓ Notices Distributed to Residents
✓ Contact Made With Citizen Coordinators
___ Other
___ Public Notices in Newspaper
___ Signal or Marker System
___ Public Meetings

* If mechanical control is requested, list type of harvester to be used and method of disposing plants

\+ If water level fluctuation is requested, list proposed beginning and ending dates.

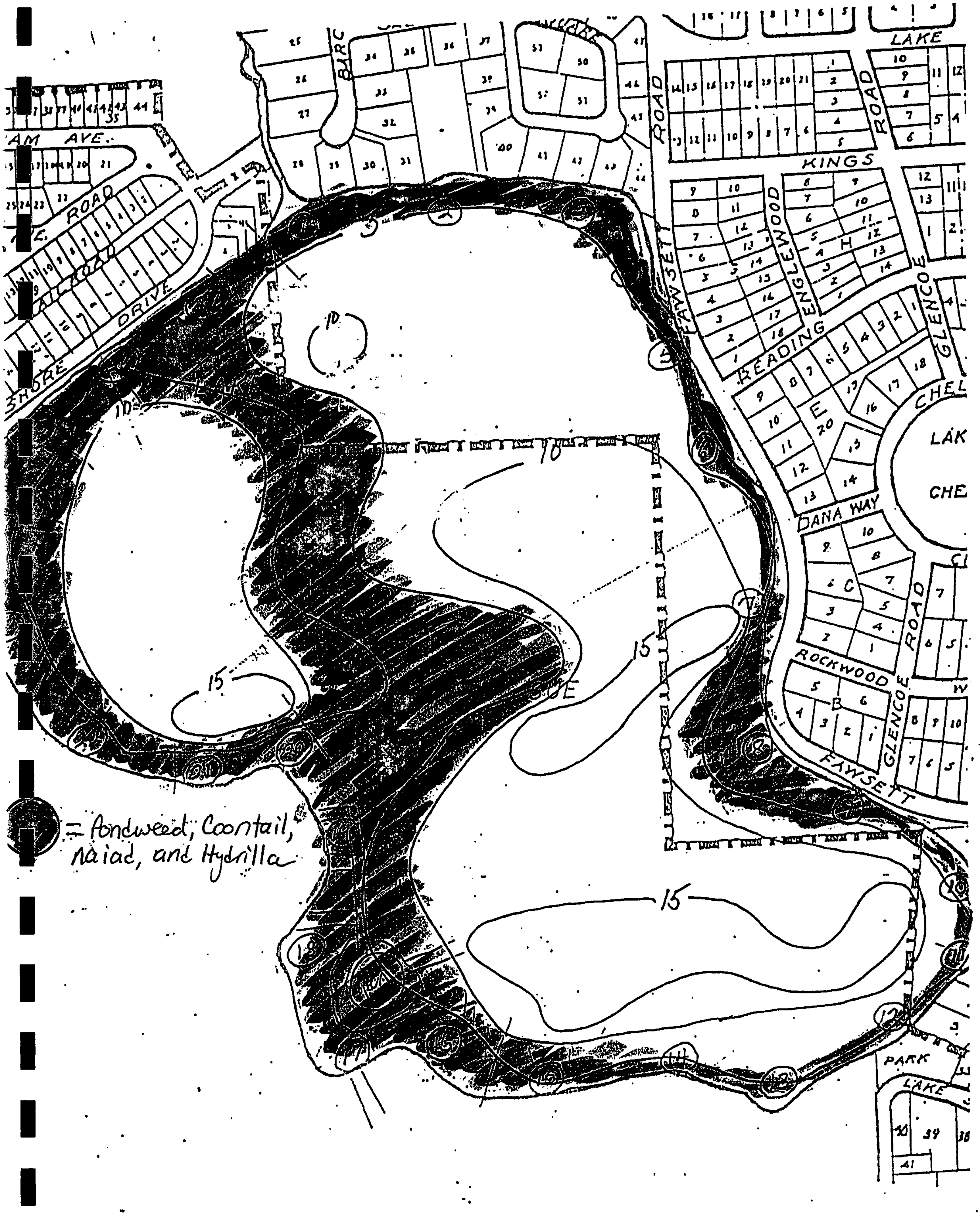
DNR 50-032 (16)

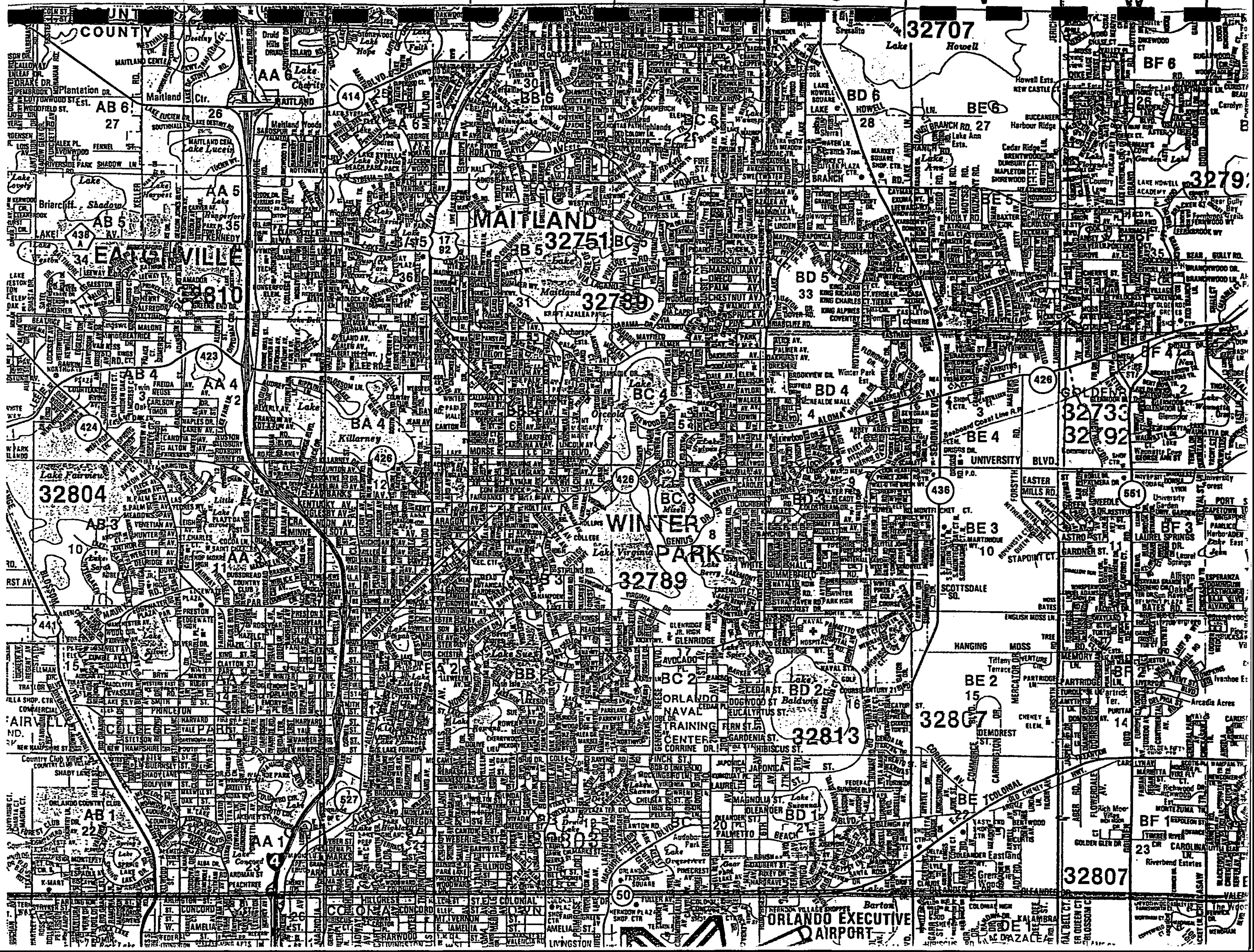
(cont'd on back)

APPLICATION FOR AQUATIC PLANT CONTROL PERMIT (CONT'D)

Water Body			Control Information		
Name or Number	Surface Acreage	County	Target Plants	Treatment Area (acres)	Chemical to be Used
Lake Sue	140	Orange	Pondweed	3.0	Aquathol K, gran & Hand remove
			Coontail	3.0	Diquat & Hand remove
			Naiad	3.0	Diquat, Aquathol Gran & Hand remove
			Algae	3.0	Cutt Chelate Hand remove
			Valisneria	3.0	Hand remove
			Knotgrass	0.5	Rodeo Hand remove
			Cattail	1.0	Rodeo Hand remove

Lake Sue


= Pondweed, Coontail, Naiad, and Hydrilla
KINGS
ROAD
FAWSETT
ENGLEWOOD
READING
GLENCOE
DANA WAY
ROCKWOOD
GLENCOE ROAD
FAWSETT
SHORE DRIVE
ROAD
PARK
LAKE
10
15



COUNTY
MAITLAND
EATONVILLE
WINTER PARK
ORLANDO NAVAL TRAINING CENTER
ORLANDO EXECUTIVE AIRPORT
32707
32751
32789
32804
32813
32807

GROVE SCIENTIFIC

COMP. BY: Bruno Ferraro

CHK. BY: ____________

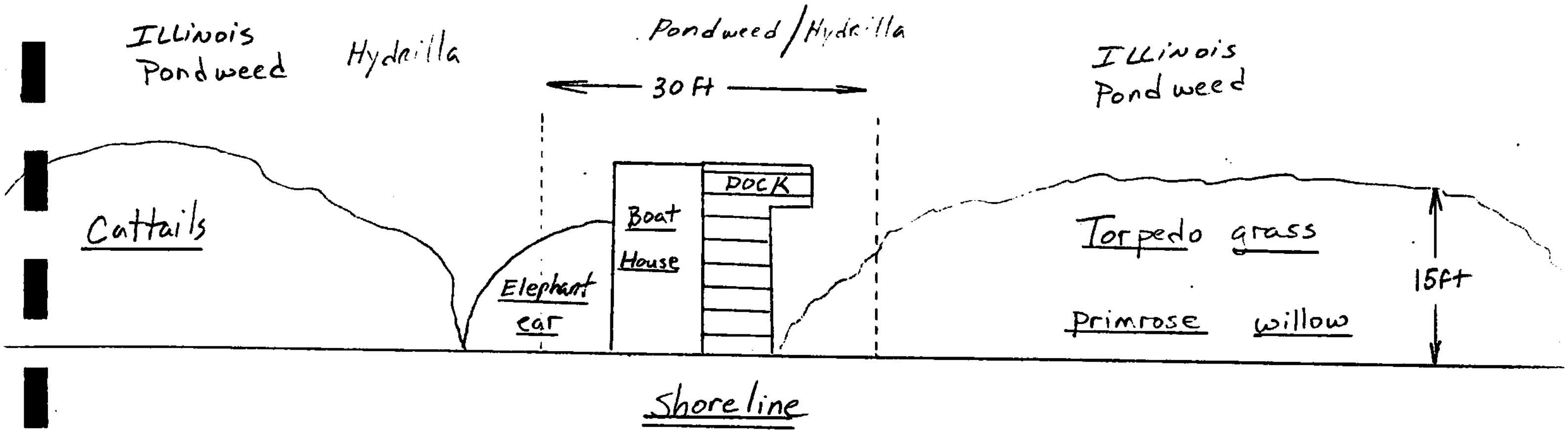
DATE: 8-14-89

SUBJECT: Typical Planting Scheme; Before and After

SHEET NO.: 4-1

JOB NO.: 05-009.00

Before



After

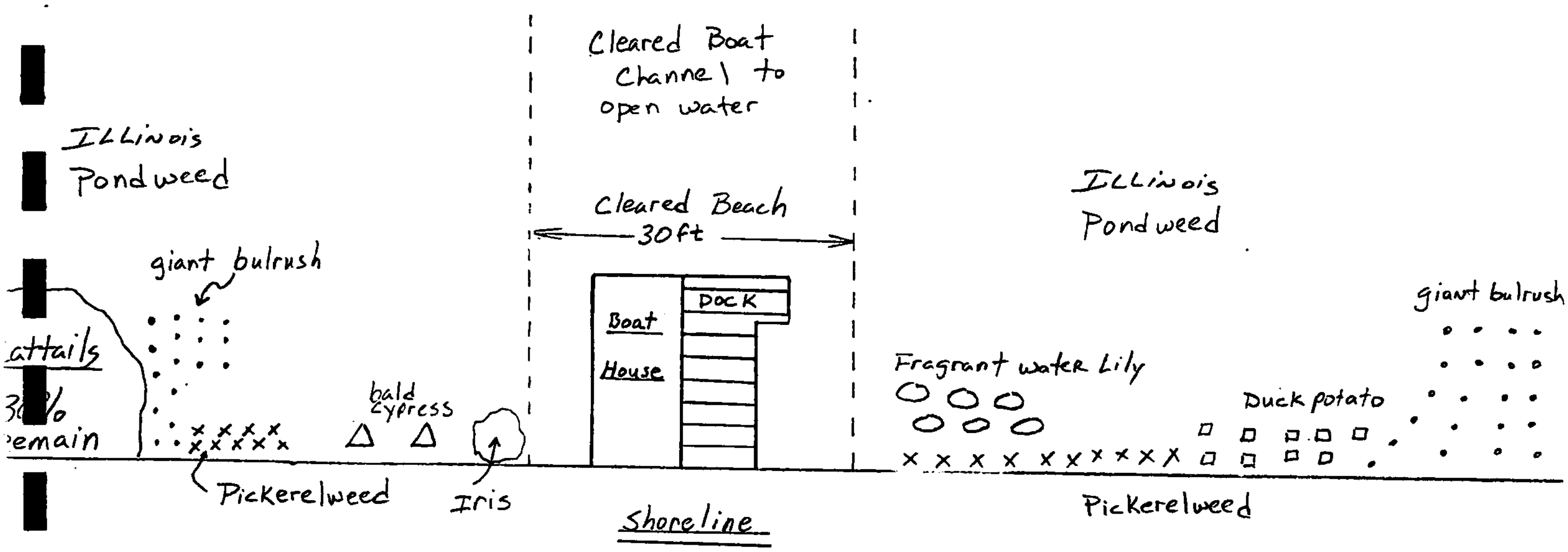
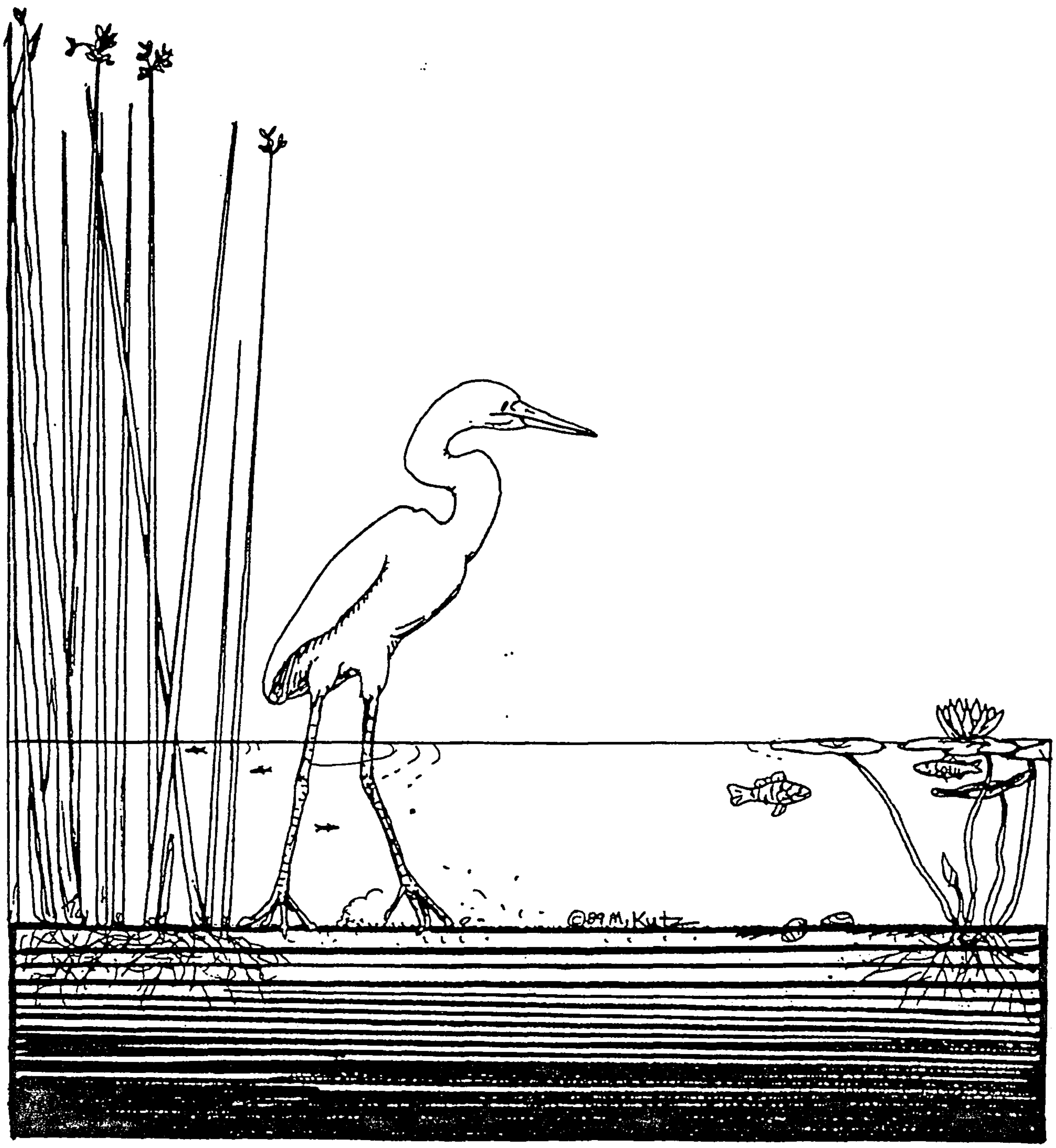


Figure 4-1

No Scale

Urban Lake Enhancement



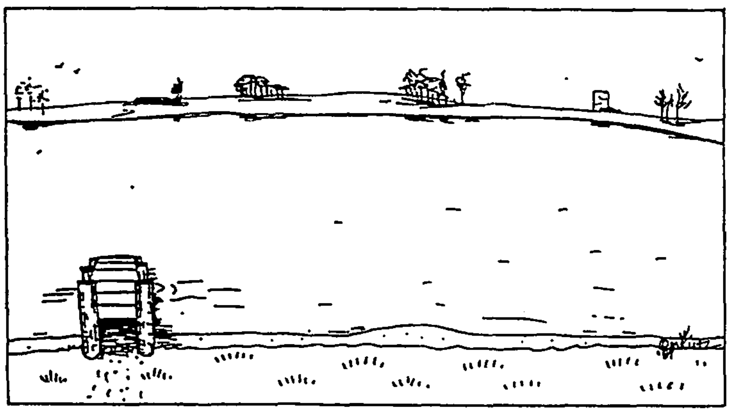
Introduction

Aquatic plants are essential for maintaining a healthy lake. Plants provide the link between the base of the food chain and the higher forms of animal life. Plants provide protection and spawning habitat, prevent shoreline erosion, and improve lake water quality by using nutrients. Aquatic plants and the wildlife they support are aesthetically pleasing additions to lakefront properties. This document will help lakefront property owners "aquascape" their shorelines, not only to help the lake, but also to enhance their properties.

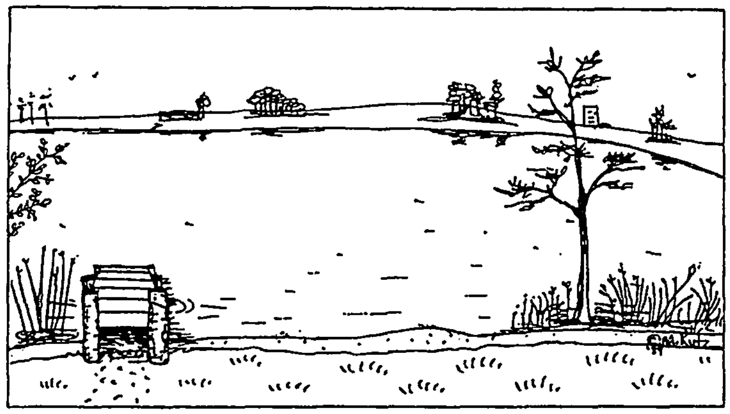
Replanting the Shoreline

Each and every lakefront property owner should become involved with the replanting process. Our lakes need wetland trees and aquatic plants to help maintain a healthy environment. Every year our lakes show increased stress from our rapidly expanding population. An indicator of such stress is severe and obnoxious "blooms" of algae. These "blooms" are nothing more than population explosions of the algae that compete with higher plants for space, sunlight, oxygen and nutrients. If we do not introduce higher plants into the lakes, then we are going to grow algae, which then compete with everything else in the lake for nutrients and all-important oxygen. Planting native Florida shoreline vegetation helps keep algae in check.

Shoreline owners should start simple. A typical lakefront has usually been stripped of most plants (see the before drawing). The replanting project should introduce trees and one or two higher aquatic plant species at the corners of the lot (see the after drawing). If every lakefront property owner can be convinced of the importance of re-introducing native wetland species, enough shoreline can be planted to convert our lakes from algae dominated systems to plant systems. Your activities can have a direct impact on the quality and the aesthetics of the lake.



BEFORE



AFTER

Several kinds of native wetland plants are listed in this brochure. The trees and other plants listed are species that the City of Orlando has successfully re-introduced along city-owned lakeshores. Of course, many additional native plant species exist that are perfectly suitable for replanting shorelines. The property owner is cautioned, however, to avoid introducing exotic (non-native) vegetation into Florida waters. Exotic plants often become difficult to control and their use is forbidden by Florida law.

A beautiful place to view an established "aquascaped" lakeshore is the Native Wetland Garden located at Leu Botanical Gardens, 1730 North Forest Avenue, Orlando, Florida (407/849-2620). The lake area has a gazebo and overlook deck that allows a close view of the native plants with name tags to facilitate identification. These labels show a leaf outline, and a simple drawing of the flower.

All the species listed are highly satisfactory, but we especially recommend that all lakefront plantings include the Bald Cypress *(taxodium distichum)*. These grand and noble trees can be planted in two or three feet of water, right at the water's edge, or even planted up on the bank. They are long-lived plants that encourage colonization by other plants and are a favorite nesting site for many water birds.

Aquatic plants are placed close to the shore in 0 to 18 inches of water. See the shoreline profile drawing for the location and depths recommended for selected species.

Once established, aquatic plants do require some maintenance. If plants become too dense, they may be thinned or divided and moved to other areas of the lake.

Here are profiles of 16 of the most reliable and easiest to find native wetland plants:

Arrowhead *(Sagittaria lancifolia)*
Also called arrowhead from the arrow-shaped leaves. Whorls of three-petaled white flowers on taller stalks appear among the leaves throughout the year. The leaves can grow up to six feet in height. Found in swamps, lakes and roadside ditches. "Wapato" is the Indian name for the edible, starchy, potato-like tuber. Full sun or light shade.

Arrowroot *(Thalia geniculata)*
A tall, bold plant with large leaves and dusty-purple flowers on very tall spikes, arrowroot will rapidly colonize a swampy area or the shallowest portion of a lake.

Bald Cypress *(Taxodium distichum)*
Deciduous, semi-aquatic tree valued for its timber. Identified by its fluted or buttressed trunk and woody "knees" that protrude from the water. The green leaves are arranged in feather-like fashion. Grow in full sun or light shade.

Blue Flag Iris *(Iris hexagona)*
A perennial with bright green leaves and flowers with six violet-blue sepals and yellow crests. Bloom in spring. Found growing in shady swamps and marshes. The term "flag" in the common name comes from the middle English word for "rush" or "reed."

Bulrushes *(Scirpus species)*
Round to triangular with no leaf blades. The flowers or inflorescences are located at stem tips. The seeds are eaten by waterfowl. Both soft-stem *(S. validus)* and giant *(S. californicus)* bulrush are planted in marshy soils. Full sun or light shade.

Loblolly Bay *(Gordonia lasianthus)*
A slender evergreen tree or shrub. Leaves are shiny green and leathery. The large and fragrant showy white flowers appear in summer. The bark was once used locally for tanning leather.

Water Canna *(Canna flaccida)*
A little known or appreciated native relative of the horticultural canna, the golden canna begins blooming in April and continues through fall with large, bright yellow flowers. Plant in swampy areas or lake shallows in full sun or light shade.

Pickerel Weed *(Pontederia cordata)*
A perennial aquatic plant with striking violet-blue flowers in spikes born well

Soft Rush *(Juncus effusus)*
This widespread native can be found in clumps on wet or dry ground. The

White Waterlily *(Nymphaea odorata)*
The large and fragrant pure white flowers of this native waterlily are

Alismataceae
Sagittaria lancifolia
arrowhead

This shallow water native has edible tubers and attractive white flowers.

Theaceae
Gordonia lasianthus
loblolly bay

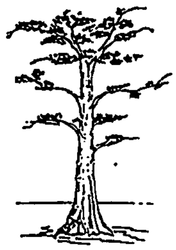
This native tree, with large white flowers in summer, grows in swamps north to North Carolina.

Marantaceae
Thalia geniculata
arrowroot

This tall herb has small purple flowers and grows in wet soil.

Cannaceae
Canna flaccida
canna

This tall native perennial grows in wet ditches and marshes. It has bright yellow flowers in spring and summer.



Taxodiaceae
Taxodium distichum
bald cypress

On wet soil or in water, this native tree may become very tall with cypress "knees" growing up from the roots.

Pontederiaceae
Pontederia cordata
pickerel weed

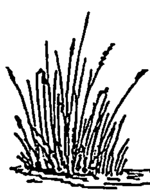
This native with attractive violet flowers may become a weed covering small ponds or ditches.

Iridaceae
Iris hexagona

This native with lilac flowers likes swampy areas all through Florida and southernmost states to Texas.

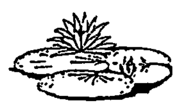
Juncaceae
Juncus effusus
soft rush

Clumps of this widespread native can be found in water or on dry ground. Ducks eat the seeds.



Cyperaceae
Scirpus californicus
giant bulrush

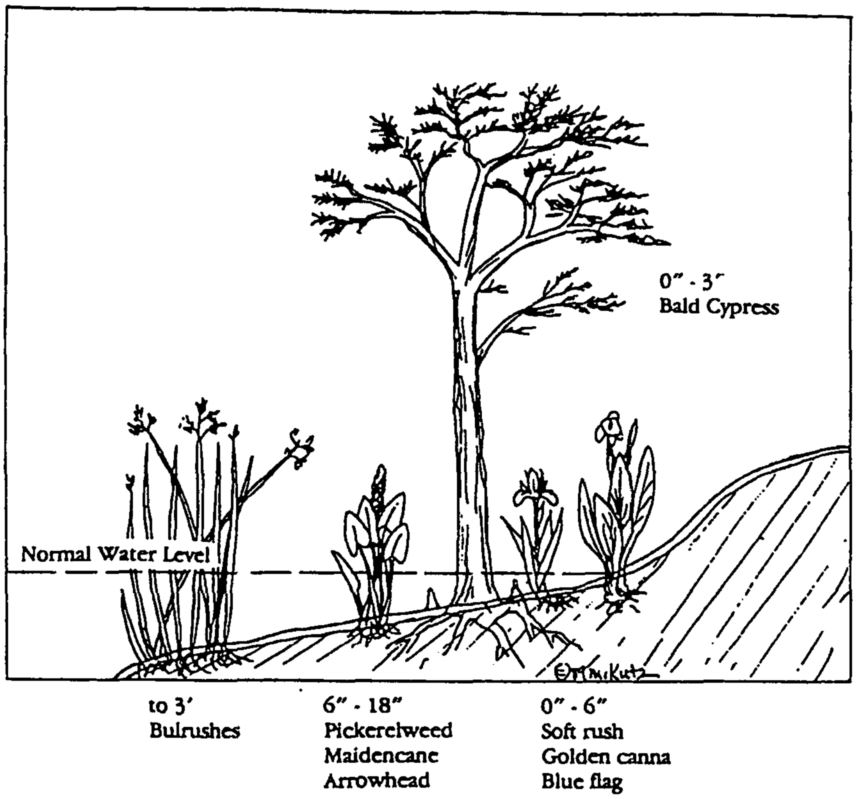
This tall sedge from California and western states grows in swamps and stream banks. The seeds are sometimes eaten by water birds.



Nymphaeaceae
Nymphaea odorata
white water lily

Although the fragrant flowers and flat leaves of this native float, it is firmly rooted in the lake.

SHORELINE PROFILE



Note: Wetland trees other than Bald Cypress should be planted at the water's edge or on the bank just above the waterline.

Questions and Answers

Q. Why are aquatic plants important for the lake?

A. Most lakes—especially urban ones—receive an excess of nutrients via run-off or the storm drainage systems. This heavy influx of nutrients will cause something to grow—either plants that we select, or unwanted algae.

Q. What do I do if my shoreline is overgrown with unwanted and ugly weeds?

A. You are encouraged to remove the weeds and plant desirable vegetation. A PERMIT TO REMOVE VEGETATION IS REQUIRED. You must contact the State Department of Natural Resources as listed.

Q. Can I spray the unwanted vegetation with an herbicide?

A. A permit is required to use aquatic hesticides. You can hire a commercial firm with the appropriate licenses to perform the work. Contact the Department of Natural Resources.

Q. Can I collect the desired plants from other lakes or roadside ditches?

A. Not without permission from the appropriate government agency or property owner. Contact the Department of Natural Resources for assistance.

Q. How can I find out more about how to grow Florida's native wetland plants?

A. Contact the agencies listed below.

Department of Natural Resources
Aquatic Plant Biologists
(407) 423-6037

City of Orlando
Bureau of Streets & Drainage
Lake Enhancement Program
(407) 849-2238

This brochure is a project of the Bureau of Streets & Drainage for the express purpose of aiding the citizens of the Greater Orlando Area. Design by DeVore & Smith, Inc.

APPENDIX G

PRICE PROPOSAL FOR AQUATIC PLANTS

THE LINER FARM, INC
* * * I N V O I C E * * *

Number : Proposal - Invoice
Account: GROVE SC
Slm # :

Date: 08/15/89
Page: 1

Bill To:
GROVE SCIENTIFIC CO.
ATTN: BRUNO FERRARO
6140 EDGEWATER DR, STE F
ORLANDO, FL 32810

Ship To:
Same
Same
,

Description	Order Date	Cust PO #	Sales Ord	Shipping Instructions
Invoice				

Code	Quantity	UM	Description	Price	Amount
100	1,207	EA	BULRUSH (SCIRPUS SP.)	$0.58	$700.06
100	1,207	EA	MAIDENCANE (PANICUM HEMITOMON)	$0.58	$700.06
100	3,622	EA	PICKEREL WEED (PONTEDERIA)	$0.49	$1,774.78
100	2,415	EA	DUCK POTATO (SAG. LANCIFOLIA)	$0.49	$1,183.35
100	604	EA	BALD CYPRESS	$0.58	$350.32
100	1,811	EA	IRIS VIRGINICA	$0.48	$869.28
100	1,207	EA	CANNA FLACCIDA	$0.54	$651.78
900	1		ORLANDO DELIVERY - NO CHARGE	$0.00	$0.00

AUG 17 1989

Terms:
COD or MAIL NEXT DAY

Remit Payment to:
P.O. Box 1369
Phone: 407-892-0038
St. Cloud, Fl 32770-1369

Disc. (0.000):	$0.00
Subtotal :	$6,229.63
Tax (EXEMPT--):	$0.00
Freight :	$0.00
Less Deposit :	$0.00
	===============
Amount Due :	$6,229.63
	===============